SELECTED WATER RESOURCES ABSTRACTS

VOLUME 2, NUMBER 11
JUNE 1, 1969

WR 69-04201 -- WR 69-04700

Selected Water Resources Abstracts is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the Clearinghouse for Federal Scientific and Technical Information (CFSTI) of the Bureau of Standards, U. S. Department of Commerce. It is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U. S. Department of the Interior, Washington, D. C. 20240. Annual subscription is $22.00 (domestic), $27.50 (foreign), single copy price is $3.00. Certain documents abstracted in this journal can be purchased from the Clearinghouse at the prices indicated in the entry. Prepayment is required.

CLEARINGHOUSE
FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION
U.S. Department of Commerce, Springfield, Va., 22151

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

GB
651
S4
vol.2
1969
Science



VOLUME 2, NUMBER 11
JUNE 1, 1969

WR 69-04201 -- WR 69-04700

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States--now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources. WRSIC is not presently prepared to furnish loan or retention copies of the publications announced.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas. Centers, and their subject coverage, now in operation are:

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Water Resources Scientific
Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

HYDROLOGIC ATLAS OF UTAH,
Utah Water Research Lab., Logan.
Roland W. Jeppson, Gaylen L. Ashcroft, A. Leon Huber, Gaylord V. Skogerboe, and Jay M. Bagley.

Report PRWG 35-1, November, 1968. 306 p, 107 fig, 30 tab, 125 ref. OWRR Project B-001-UTAH.

Descriptors: *Hydrology, *Temperature, *Precipitation, *Runoff, *Groundwater, Storage requirements, Water quality, Flood frequencies, Flow duration.

To supply valuable information describing hydrologic and climatologic phenomena in formats such as charts, tables, figures and maps which can be used for a wide variety of design and planning needs, the 'Hydrologic Atlas of Utah' has been prepared. The components involved in the hydrologic cycle--temperature, precipitation, surface waters and ground waters--are each presented in detail on a state wide basis. Each of these presentations consists of a section listing sources, quantity and quality of basic hydrologic data, followed by a section of analyses of this basic data to develop relationships for extrapolating to areas lacking data, and to define probabilities of time variations. From these analyses maps, charts and/or tables have been prepared to describe that component of the hydrologic cycle. The surface and ground water components are described in terms of both quantities and qualities.
W69-04209

LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
British Columbis Univ., Vancouver. Dept. of Mathematics; British Columbia Univ., Vancouver. Inst. of Oceanography; and Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
L. A. Mysak, and B. V. Hamon.
J Geophys Res, Vol 74, No 6, pp 1397-1405, Mar 15, 1969. 9 p, 9 fig, 15 ref. Nonr grant 1866 (51).

Descriptors: *Sea level, *Continental shelf, *Continental slope, *Waves (Water), North Carolina, Pressure, Variability, Water level fluctuations, Wavelengths, Velocity, Atmospheric pressure, Gaging stations, Weather data, Currents (Water), Frequency, Frequency analysis.
Identifiers: Morehead City (NC), Southport (NC).

Low-frequency sea-level behavior was investigated on the basis of atmospheric pressure and sea level observations recorded at Morehead City and Southport, North Carolina. The study shows the presence of nonbarometric response of sea level to atmospheric pressure off the North Carolina coast, especially in the 3-10 day period range. Cross-spectrums between sea levels adjusted to constant atmospheric pressure at the two stations show phase shifts consistent with the hypothesis of continental shelf waves traveling in the direction predicted by theory, that is southward. (Gabriel-USGS)
W69-04224

A DISSIPATIVE RIVER FLOW MODEL,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
Donald R. Jackson.
J Hydrol, Vol 6, No 1, pp 33-44, Jan 1968. 12 p, 3 fig, 7 ref, 2 append.

Descriptors: *Routing, *Hydrograph analysis, *Unit hydrographs, *Hyetographs, Rainfall-runoff relationships, Flood routing, Runoff, Hydrographs, Hydrography, Streamflow forecasting, Discharge (Water), Surface runoff, Synthesis.
Identifiers: Instantaneous unit hydrograph.

Runoff is predicted by use of the conceptual model of the instantaneous unit hydrograph of a stream, that is, the hydrograph of a unit rainfall excess uniformly and instantaneously applied over the basin. The model assumes routing the rainfall excess through a series of resistive and dissipative elements. Integration of the instantaneous unit hydrograph yields the unit hydrograph. The second order differential equation of a river system is derived, solved, and compared with other stream-system models. The model presented is complex and requires a digital computer for fitting to problems and for hydrograph computation. Only the rainfall excess hyetograph and the outflow hydrograph of the stream for the same storm are required for fitting purposes. (Knapp-USGS)
W69-04232

ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
Weather Bureau, Washington, D. C. Geophysical Fluid Dynamics Lab.
Eugene M. Rasmusson.
Mon Weather Rev, Vol 96, No 10, pp 720-734, Oct 1968. 15 p, 12 fig, 7 tab. Grants GP-820-NSF and GP-3657-NSF. Supported in part by NSF, USAF 433L Prog, and Mitre Corp.

Descriptors: *Meteorology, *Water vapor, *Synoptic analysis, Climatology, Precipitation (Atmospheric), Evapotranspiration, Weather patterns.
Identifiers: Water vapor transport.

The atmospheric water vapor flux divergence and water balance of North America are investigated. The mean vertical distribution of flux divergence is computed for the months of January (1962,1963) and July (1961,1962). Strong flux convergence in the lowest kilometer and divergence in the remainder of the troposphere were found in July. Flux convergence was found throughout the troposphere over the eastern half of the area in January, with a maximum between 900 and 950 mb.; while in the west, convergence was found above 800 mb., with weak divergence below. Over the west, the flux divergence above 500 mb. is quite significant. The vertically integrated flux divergence is used in estimating the mean difference between precipitation and evapotranspiration. Although the flux divergence exhibits a pronounced diurnal variation south of 50 deg N., particularly during the summer, the results of water balance computation over the United States and southern Canada, using twice-daily observations from the existing aerological network, indicate that reliable mean annual, seasonal, and monthly values of the mean difference between precipitation and evapotranspiration can usually be obtained when averaging over large areas. A comparison of values computed by means of the atmospheric water vapor balance equation, with those computed using Thornthwaite climatic water balance data indicates that over the United States and southern Canada the latter systematically overestimates the mean difference during the winter, and underestimates it during the summer by a substantial amount. Over eastern North America, the departure from normal of precipitation by itself serves as a fairly good quantitative indicator of the departure from normal storage change. (Knapp-USGS)
W69-04246

HEAT EXCHANGE IN THE ENVIRONMENT,
John E. Edinger, and John Geyer.
Report, Department of Sanitary Engineering and Water Resources, The Johns Hopkins University, Baltimore, Maryland, Project No. 49, June 1, 1965.

Descriptors: *Heat transfer, *Heat balance, *Hydrodynamics, *Meteorology, Thermal conductivity, Powerplants, Transfer, Heat exchangers, Equipment, Cooling, Fluid mechanics.

This report deals with the physics of heat transfer phenomena occurring in surface waters and is designed to assist engineers and scientists in carrying out temperature computations related to the heating and cooling of natural waters. In the initial chapters, known principles of meteorology, hydrodynamics, and heat transfer are used to develop general formulations for heat exchange between natural waters and the atmosphere. The formulations are then applied to situations in which temperature predictions will prove useful to the power industry.
W69-04467

GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
Frederick C. Bell.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6357, pp 311-327, Jan 1969. 17 p, 7 fig, 5 tab, 21 ref.

Descriptors: *Rainfall-runoff relationships, *Duration curves, *Depth-area-duration analysis, *Hydrograph analysis, Runoff, Rainfall disposition, Rainfall intensity, Mass curves, Runoff forecasting, Meteorology, Hydrology, Streamflow forecasting.
Identifiers: Rainfall-duration-frequency curves, Depth-duration curves, Depth-frequency curves.

Rainfall-duration-frequency estimates for engineering purposes are usually subject to large sampling errors and extensive generalizations of the basic data are therefore advantageous from the point of view of estimation efficiency. Relationships between high-intensity rainfall values for durations up to 2 hr and return periods up to 100 hr are appropriately expressed by means of 'depth-duration' and depth-frequency' ratios. These ratios are shown to have surprisingly consistent values in such diverse places as Alaska, Hawaii, Puerto Rico, South Africa and Australia, as well as the contiguous United States, and it is suggested that a physical explanation exists for such consistencies. The data may be conveniently generalized with one of several alternative depth-duration-frequency functions which should be useful for estimates in regions of limited data. (Knapp-USGS)
W69-04549

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
Mordechai H. Diskin.
ASCE Proc, J Hydraul Div, Vol 95, No NY1, Pap 6359, pp 329-346, Jan 1969. 18 p, 9 fig, 6 tab, 9 ref, append.

Descriptors: *Hydrograph analysis, *Hyetographs, *Hydrographs, *Unit hydrographs, *Mathematical studies, Mathematical models, Numerical analysis, Rainfall intensity, Rainfall disposition, Rainfall-runoff relationships, Storm runoff.
Identifiers: Instantaneous unit hydrographs, Convolutional integrals.

A new method is presented for the analysis of rainfall excess hyetographs and direct surface runoff hydrographs and for the derivation of instantaneous unit hydrographs. The method assumes that the IUH can be approximated by a segmented polygon composed of straight lines and that the duration of the rainfall excess is shorter than or equal to the duration of the shortest of the straight line segments composing the polygon. Other assumptions are that the watershed system for which the input and output curves are available is a linear time invariant system and that it is initially relaxed. The method is based on a theorem for the convolution of derivatives of functions and shows how the derivatives of the assumed instantaneous unit hydrograph can be obtained from an analysis of the shapes of the available rainfall excess hyetograph and direct surface runoff hydrograph. Numerical examples accompany the development of the method and a final example illustrating the application of the method is also included. (Knapp-USGS)
W69-04553

THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02B.
W69-04567

THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
Forestry Sciences Laboratory, Moscow, Idaho.
For primary bibliographic entry see Field 02E.
W69-04570

WATERSHED CALIBRATION METHODS,
Forest Service (USDA) Upper Darby, Pa. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W69-04634

2B. Precipitation

CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
Weather Bureau, Helena, Mont. Airport Station.
R. A. Dightman.
Mon Weather Rev, Vol 96, No 11, pp 813-823, Nov 1968. 11 p, 19 fig, 2 tab, 7 ref.

Descriptors: *Floods, *Montana, *Precipitation (Atmospheric), *Historic flood, Cloudbursts, Discharge (Water), Maximum probable flood, Rain, Storm runoff.
Identifiers: Musselshell River (Mont).

The meteorological features associated with the greatest flood of record (June 6-15, 1967) in the Central Musselshell River Valley of Montana are examined and the flooding and rainfall distribution are described and compared with other Eastern Montana flood-producing storms. Applications of RADAR to forecasting this flood are discussed. In some parts of the Musselshell drainage the rainfall intensity exceeded that of a 100-yr probable maximum 2-day storm. (Knapp-USGS)
W69-04237

MARKOV CHAINS OF ORDER GREATER THAN ONE,
Oregon State Univ., Corvallis. Dept. of Statistics.
William P. Lowry, and Donald Guthrie.
Mon Weather Rev, Vol 96, No 11, pp 798-801, Nov 1968. 4 p, 6 tab, 14 ref.

Descriptors: *Markov processes, *Precipitation (Atmospheric), Weather data, New Mexico, Colorado, Oregon, Climatology, Climatic data, Climatic zones, Meteorology.
Identifiers: High-order Markov processes.

Means are proposed whereby a test for the goodness of fit and an estimate of the order of a Markov chain model may be obtained concurrently. Application of the method to daily precipitation data for 2 seasons of about 30 yr in New Mexico, Colorado, and Oregon suggests 2 tentative conclusions. First, within a single climatic area, order estimates tend toward zero as precipitation events become rarer. This may occur at the drier stations or at higher thresholds defining a wet day. Second, between climatic areas, the station with the greater diversity of air mass types will tend to have order estimates greater than the station having the same seasonal mean precipitation but a less diverse climate. (Knapp-USGS)
W69-04238

WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
California Univ., Los Angeles. Dept. of Geography.
Stanton E. Tuller.
Mon Weather Rev, Vol 96, No 11, pp 785-797, Nov 1968. 13 p, 16 fig, 1 tab, 22 ref.

Descriptors: *Precipitation (Atmospheric), *Synoptic analysis, *Precipitable water, Meteoric water, Moisture content, Water vapor, Air circulation, Meteorology, Weather patterns, Climatology, Monsoons, Weather, Weather data, Weather patterns.
Identifiers: Annual precipitable water.

Mean values of precipitable water are determined for 182 stations throughout the world using a 3-yr period and evaluation methods developed by Peterson and Showalter. The resulting distribution is presented on a series of monthly maps and a map of the annual mean value. A general latitudinal pattern is present, especially over the oceans, with Highs near the Equator and Lows at the Poles. The continents show the effects of elevation and distance from the sea. The highest yearly mean is found in the Bay of Bengal in the summer. Other areas of high precipitable water are the tropical lowlands. Lowest values are in the high latitudes, continental interiors, and at high elevations in winter. Annual ranges are greatest in the Bay of Bengal and interior Asia and lowest over the equatorial oceans. (Knapp-USGS)
W69-04239

ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
Weather Bureau, Washington, D. C. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 02A.
W69-04246

GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W69-04549

THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
Colorado State Univ., Fort Collins.
Petar Todorovic, and Emir Zelenhasic.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 7-24, Dec 1968. 18 p, 8 fig, 3 tab, 6 ref.

Descriptors: *Rainfall disposition, *Mathematical models, *Stochastic processes, *Probability, Rainfall, Statistical models, Statistical methods, Rainfall intensity, Hyetographs, Synthetic hydrology.
Identifiers: Probability of extreme events, Rainfall intensity probability.

A mathematical method is presented for interpretation and analysis of extreme values of precipitation at a given location on the surface of the earth. The method gives the corresponding distribution functions for the minimum and maximum storms during a sample composed of n successive storms, where n = 2,3,...To check the descriptive capabilities of the method, it was applied to a 70-year record of rainfall at a precipitation station at Durango, Colorado. (Knapp-USGS)
W69-04567

2C. Snow, Ice, and Frost

EFFECTS OF SOIL FREEZING ON WATER YIELDS,
Colorado State Univ., Fort Collins; and Forest Service, Washington, D. C.
Arnett C. Mace, Jr.
Forest Serv Res Note RM-121, 1968. 4 p, 1 fig, 3 tab, 13 ref.

Descriptors: *Frost, *Frozen ground, *Infiltration, *Forest soils, Arizona, Snowmelt, Soil water movement, Groundwater movement, Forests, Mountains, Snow.
Identifiers: Concrete frost, Granular frost, White Mountains (Ariz).

The effects of 2 different frost types, concrete and granular freezing, on soil water infiltration were studied in the White Mountains of Arizona. Concrete frost occurs in the open grassland areas, and appears to increase surface runoff. Only granular frost occurs in the timber types, and appears to decrease surface runoff and increase soil moisture recharge. Concrete freezing causes increased soil moisture and reduced bulk densities in the zone of freezing, whereas granular freezing has no effect on these properties. (Knapp-USGS)
W69-04251

OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
Colorado State Univ., Fort Collins; and Forest Service, Washington, D. C.
Peter F. Ffolliott, and Edward A. Hansen.
Forest Serv Res Note RM-124, 1968. 7 p, 4 fig, 16 ref.

Descriptors: *Snowpacks, *Snow management, *Water yield improvement, *Forest management, Water resources, Runoff, Snowmelt, Overland flow, Runoff forecasting, Interception, Snow surveys, Arizona.
Identifiers: Snowpack-forest cover-runoff relations.

Intensive measurements of snow and streamflow on a 425-acre ponderosa pine watershed indicated that more than 90% of the snowpack left the watershed as runoff. Snow accumulation was inversely related to forest density, which indicates a possible opportunity for increasing snow accumulation through more intensive forest management. (Knapp-USGS)
W69-04253

GLACIERS AND WATER SUPPLY,
Geological Survey, Tacoma, Wash.
Mark F. Meier.
J Amer Water Works Ass, Vol 61, No 1, pp 8-12, Jan 1969. 5 p, 3 fig, 2 photo, 3 tab, 6 ref.

Descriptors: *Glaciers, *Melting, *Runoff, *Water sources, Climatology, Water resources development, Water supply, Management, Watershed management, Water management (Applied), Alaska, Pacific Northwest U.S., Rocky Mountain Region.
Identifiers: Glacial regulation.

About three-fourths of the world's fresh water is stored as glacier ice. In North America the volume of water stored in snow and ice is many times greater than the volume stored in all the surface waters of the continent. The impact of glaciers on water resource use is greatest in Alaska, the Pacific Northwest, Northern Rockies, and Middle Rockies. In the Northwest and Rockies the glaciers, small by Alaskan standards, are important streamflow sources and regulators. Glacial regulation makes water supply more reliable, but forecasting seasonal water release is nearly impossible by ordinary snow survey procedures, because runoff prediction depends almost entirely on summer heat balance, radiation, and albedo measurements all of which are subject to large uncertainties. Variability of runoff is reduced because unusually hot summers, which melt more ice, also usually produce less precipitation. Artificial control of glacier melting as a means of managing water resources is discussed. (Knapp-USGS)
W69-04255

THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
Forestry Sciences Laboratory, Moscow, Idaho.
For primary bibliographic entry see Field 02E.
W69-04570

2D. Evaporation and Transpiration

ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
Weather Bureau, Washington, D. C. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 02A.
W69-04246

VARIATIONS OF EVAPORATION IN TIME AND SPACE: PART 1 AND PART 2,
Nottingham Univ. (England). School of Agriculture.
David C. Davenport.
J Hydrol, Vol 5, pp 312-350, 1967. 18 fig, 1 plate, 6 tab, 35 ref.

Descriptors: *Evaporation, *Diurnal distribution, *Spatial distribution, *Lysimeters, *Weather, Climate, Temperature, Winds, Vapor pressure, Humidity, Topography.
Identifiers: *Evaporimeters, Diurnal evaporation pattern, Spatial evaporation pattern.

Daily lateral, and vertical variations in measured and calculated evaporation rates were accounted for by changes in various weather factors, using simple and multiple regression analyses. Partial correlations indicated that solar radiation accounted for about 70% of the variations in water losses from dish evaporimeters, whereas the corresponding influences of temperature, vapor pressure deficit and wind, as individual factors, were about 35% nil, and 60% respectively. However, radiation, temperature, and wind, as component factors, each showed a lower correlation with evaporation, whereas vapor pressure deficit showed a higher and significant correlation. The degree of association between evaporation and weather factors was greater when the number of daily observations used in the analysis was doubled. Multiple-regression analyses showed that the combined effects of the 4 weather parameters were responsible for about 90 and 50% of the observed variations in evaporation and transpiration rates, respectively. The rates of evaporation, calculated by the multiple regression equations, agreed well with evaporation observed on days other than those used for making the regression. Significant correlations were also found between evaporation from small dishes and a US Class A pan, and between evaporation and transpiration from grass in lysimeters. (Knapp-USGS)
W69-04618

2E. Streamflow and Runoff

TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
Tennessee Valley Authority, Knoxville.
B. Buehler, J. T. Price, and J. M. Garrison.
Proceedings, 7th Annual Sanitary and Water Resources Engineering Conference, Vanderbilt University, Nashville, Tennessee, pp 125-138 May 1968.

Descriptors: Unsteady flow, Simulation, Rivers, Reservoirs, Transient flow, Hydraulics, Computers, Open channels, Waves, Field measurements.
Identifiers: *Stream channels, Turbine operations, Tennessee Vallwater flow, *TVA.

Most mathematical modeling of unsteady flow phenomena has been limited to prismatic channels and somewhat idealized conditions. The Tennessee Valley Authority, using the numerical methods developed by Stoker, has successfully applied these techniques to a variety of complex unsteady flow problems which have occurred, or are expected to occur, in some of TVA's system of reservoirs and natural river channels. This paper describes the mathematical model of unsteady and nonuniform free-surface flow used to compute discharges, mean velocities, and water surface elevations in Wheeler Reservoir, in northern Alabama. Flows in this reservoir result primarily from widely varying hydroplant operations at Guntersville Dam at the upstream end of the reservoir and at Wheeler Dam at the downstream end. The Wheeler Reservoir computational model was set up specifically to study preoperational flow conditions at the site of the new Browns Ferry Nuclear Plant, now under construction. The plant site is about 55 miles downstream from Guntersville and 19 miles upstream from Wheeler. The mathematical model was verified against field measurements of water surface elevation and velocity. The model is described in this paper and the results from the Browns Ferry studies are given. These results include verification of the model, computed results for the plant site, and several sets of results to demonstrate the use of the model as a tool to establish a desired flow at any point along the reservoir.
W69-04203

GEOMORPHIC GROUPING OF SOILS IN WATERSHED ENGINEERING,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
Charles B. England, and H. N. Holtan.
J Hydrology, Vol 6, pp 13-21, 1968. 9 p, 2 tab, 3 fig, 22 ref.

Descriptors: *Geomorphology, Topography, Soil groups, Soil physical properties.
Identifiers: Hydrologic response units.

Soil properties significant to processes of infiltration, moisture storage, drainage, and the hydraulics of surface flow are related to topographic position. Areal and elevational distributions of soils provide a basis for interpretative grouping of soil mapping units in computations for watershed engineering. Soils on an ARS experimental watershed, grouped by deep upland, shallow hillside, and very deep depositional, were plotted on a contour map of the watershed surface. The elevational sequences thus obtained are representative of the hydraulic relationships between hydrologic response units in small agricultural watersheds. Profile characteristics, areal distribution, and relative elevation position of the units determine watershed response to storm rainfall. (England-USDA Hydro Lab)
W69-04207

FLOOD PLAIN INFORMATION, CALCASIEU RIVER, OAKDALE, LOUISIANA.
Switzer (Albert) and Associates, Inc., Baton Rouge, La.
For primary bibliographic entry see Field 04A.
W69-04215

FLOOD PLAIN INFORMATION, LAS CHOLLAS CREEK, SAN DIEGO COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W69-04217

FLOOD PLAIN INFORMATION, FEATHER AND YUBA RIVERS, MARYSVILLE-YUBA CITY, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 04A.
W69-04218

CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
Weather Bureau, Helena, Mont. Airport Station.
For primary bibliographic entry see Field 02B.
W69-04237

STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
Geological Survey, Washington, D. C.
James L. Patterson.
Geol Surv Water-Supply Pap 1859-G, pp G1-G36, 1968. 36 p, 14 fig, 1 plate, 2 tab, 7 ref.

Descriptors: *Water supply, *Streamflow, *Storage, *Reservoirs, *Arkansas, Reservoir storage, Quality control, Retention, Flood control, Regulated flow, Safe yield, Waste dilution, Data collections.
Identifiers: Storage requirements.

The supply of good-quality surface water in Arkansas is abundant. Owing to seasonal and annual variability of streamflow, however, storage must be provided to insure dependable year-round supplies in most of the State. Storage requirements for draft rates that are as much as 60% of the mean annual flow at 49 continuous-record gaging stations can be obtained from tabular data in this report. Through regional analyses of streamflow data, the State was divided into 3 regions. Draft-storage diagrams for each region provide a means of estimating storage requirements for sites on streams where data are scant, provided the drainage area, the mean annual flow, and the low-flow index are known. These data are tabulated for 53 gaging stations used in the analyses and for 132 partial-record sites where only base-flow measurements have been made. Mean annual flow can be determined for any stream whose drainage lies within the State by using the runoff map in this report. Low-flow indices can be estimated by correlating base flows, determined from several discharge measurements, with concurrent flows at nearby continuous-record gaging stations, whose low-flow indices have been determined. (Knapp-USGS)
W69-04250

GLACIERS AND WATER SUPPLY,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 02C.
W69-04255

MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
Hull Univ. (England). Dept. of Geography.
Ian Douglas.
Nature, Vol 215, No 5104, pp 925-928, Aug 26, 1967. 4 p, 4 fig, 26 ref.

Descriptors: *Sediment yield, *Vegetation effects, *Erosion, *Land use, Sediment discharge, Cultivation, Streams, Geomorphology, Impact (Rainfall), Slopes, Topography, Sedimentation.
Identifiers: Australia.

Reconnaissance studies in a wide range of climatic conditions in Australia suggest that sediment yields of many rivers draining areas of long human use are far in excess of yields of the geological past. Sediment yield is a combined effect of runoff and vegetation cover, both of which are affected by human use of land. Comparison of Australian rivers draining largely unsettled areas with rivers elsewhere with similar mean annual runoff but which drain settled areas, shows that the settled areas contribute as much as 50 times as much sediment as the unsettled areas. (Knapp-USGS)
W69-04269

SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 03B.
W69-04273

MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 07B.
W69-04547

HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
Geological Survey, Washington, D. C.

For primary bibliographic entry see Field 04C.
W69-04548

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning; and Wisconsin Univ., Madison. Dept. of Civil Engineering.
Colby V. Ardis, Kenneth J. Dueker, and Arno T. Lenz.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6365, pp 383-408, Jan 1969. 26 p, 13 fig, 12 tab, 12 ref, append.

Descriptors: *Drainage, *Storm drains, *Drainage water, *Waste water disposal, *Waste water treatment, Wisconsin, Urbanization, Runoff, Storm runoff, Cost analysis, Drainage systems, Water pollution control.
Identifiers: Urban hydrology, Municipal engineering, Storm sewers.

Wisconsin cities with populations of 7,500 to over 60,000 are rapidly developing comprehensive plans independent of community size with all storm sewer designs done by registered professional engineers. Storms with 5 to 10 yr frequency are used in design. Two-foot inlets depressed one in., 12-in. minimum pipe size and pipe velocities of 2 to 15 fps are common. Storm water pollution is recognized but only 1/3 of cities have ideas on its alleviation. Urban drainage designers who provided current practice, policy, procedure, and cost information for a typical 15-acre, 6-block area indicated wide diversity in results when using the Rational Method to compute flows. Only 6 of 23 cities which contributed sample designs used variable intensities correctly in the Rational Method. Errors in the use of the runoff coefficient C was common. The resulting designs gave flows of 68 to 100 cfs at outlet; total project costs which varied from $8,000 to $65,000 for this sample area. The need for narrower guide lines for design is suggested. (Knapp-USGS)
W69-04551

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W69-04553

SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
Geological Survey, Fort Collins, Colo.
R. S. McQuivey, and Everett V. Richardson.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6349, pp 209-223, Jan 1969. 15 p, 11 fig, 3 tab, 9 ref, append.

Descriptors: *Turbulence, *Open channel flow, *Anemometers, Heat transfer, Water circulation, Instrumentation, Flowmeters, Research and development, Hydraulics.
Identifiers: Hot-wire anemometers.

Measurements of the characteristics of turbulence in hydrodynamically smooth and hydrodynamically rough open-channel flow using hot-film anemometry technics showed: (a) that the relative turbulent intensity of the vertical velocity component was about 60% of the longitudinal, (b) that the spectral energy distribution was not significantly affected by the type of flow, (c) that most of the turbulent energy is contained in frequencies less than 5 hertz, (d) the macroscale of the turbulence as determined from the autocorrelation function was on the same order as the depth and (e) the ratio of the microscale to depth ranged from 0.1 to 0.2. The measurements were used to verify experimentally the longitudinal direction momentum terms in the Navier-Stokes equation and to determine qualitatively the magnitude of the production, diffusion, and dissipation terms in the energy equation. (Knapp-USGS)
W69-04555

CURRENTS IN AN INTEROCEANIC CANAL,
Corps of Engineers, Jacksonville, Fla. Interoceanic Canal Studies Branch.
Edwin W. Eden, Jr.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6342, pp 79-101, Jan 1969. 23 p, 16 fig, 7 tab, 8 ref.

Descriptors: *Canals, *Tidal effects, *Currents (Water), *Mathematical models, Navigation, Tides, Streamflow, Panama Canal, Canal design, Hydraulics.
Identifiers: Finite difference methods, Tidal currents, Panama sea-level canal.

The feasibility of a sea-level canal between the Atlantic and Pacific Oceans is under consideration by the U. S. Corps of Engineers as the agent for an Interoceanic Canal Commission appointed by President Johnson. The tidal and hydrologic studies made for the feasibility study are described, tidal currents are estimated, their impacts on the canal and the potential shipping are estimated. Considerable variation in character and range of tides is experienced. Currents in a sea-level canal were based on a mathematical model utilizing an explicit finite difference method. The current varies with tidal range and phasing and canal cross-secional width and depth, length, and roughness. Currents caused by the flow of fresh water during flood times are also considered. A method of reducing tidal currents is described. (Knapp-USGS)
W69-04557

EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 04C.
W69-04560

WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
Geological Survey, Iowa City, Iowa.

Geol Surv Duplicated rep, 1968. Total 257, 3 fig, 2 tab, 16 ref.

Descriptors: Data collections, *Surface waters, *Streamflow, Iowa, *Water quality, Stream gages, Lakes, Reservoirs, Stage-discharge relations, Water temperature, Sediment discharge.
Identifiers: Surface water records, Water quality records, Water resources data.

The surface-water records for the 1968 water year for gaging stations, partial-record stations, and miscellaneous sites in Iowa are presented. The data generally comprise a description of the station and a table showing the daily discharge and monthly and yearly discharge of the stream. The description of the station gives the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. The type of gage currently in use and the datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the period of records available are listed. Information on the accuracy of the records and conditions which affect the natural flow is given under 'Remarks.' Daily discharges, average discharge, extremes, yearly totals, and peak discharges are listed in a table. Chemical quality, fluvial sediment, and water temperatures are also listed. The chemical quality includes concentrations of individual dissolved constituents, hardness, specific conductance, and pH. Fluvial-sediment information is given for suspended-sediment discharges and concentrations. Water-temperature data represent once-daily observations except for stations where a continuous temperature recorder furnishes information from which daily minimums and maximums are obtained. (Knapp-USGS)
W69-04565

A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
Universidad Nacional del Zulia, Maracaibo (Venezuela). Civil Engineering School.
Ignacio Rodriquez-Iturbe.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 25-41, Dec 1968. 17 p, 13 fig, 2 tab, 12 ref.

Descriptors: *Mathematical models, *Synthetic hydrology, *Streamflow, Stochastic processes, Statistical methods, Time series analysis, Forecasting, Streamflow forecasting, Regression analysis.
Identifiers: Spectral analysis, Orinoco River.

A mathematical model is built for monthly river flows of the Orinoco River. The model consists of a cyclic part which explains up to 93% of the total variance of the series of monthly water levels, and a stochastic part which is shown to follow a 1st order autoregressive scheme with a primary variable or random component that behaves as 'white noise' and appears to have near 60% chance of coming from a normal population. A time series of flow anomalies is obtained from long term monthly means. Statistical techniques are applied to the series of flow anomalies in order to obtain the mean number of crossings at an orbitrary level during an arbitrary time. There are also studied the mean length of an upward excursion over an arbitrary level and the mean time between successive upcrossings. The actual results for the Orinoco River are in good agreement with the statistical theory showing that this actual results for the Orinoco River are in good agreement with the statistical theory showing that this kind of analysis can be extremely useful in the design and planning of reservoir operations. (Knapp-USGS)
W69-04568

THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
Forestry Sciences Laboratory, Moscow, Idaho.
Harold F. Haupt.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 65-76, Dec 1968. 12 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Rainfall-runoff relationships, *Snowmelt, Runoff forecasting, Runoff, Hydrographs, Temperature, Rainfall, Snowpacks, Water yield, Idaho.
Identifiers: Snowmelt-runoff relationships, Experimental watersheds.

Spring peak flows recorded over a 25-year period in Benton Creek, a small forested watershed in northern Idaho, were studied in their relation to meteorological events. More peak flows were generated by rain-on-snow than by clear-weather snowmelt; the 2 types of peaks differ in magnitude and in other characteristics. Two rather simple techniques were used to calculate the generative capacity of a rainfall-temperature event and the hypothetical outflow of water from a snowpack during rainy and rainfree periods. Similar data on spring peaks on 2 regional subbasins were considered also. (Knapp-USGS)
W69-04570

TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
Illinois Univ., Urbana.
G. Ranalli, and A. E. Scheidegger.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 77-85, Dec 1968. 9 p, 6 fig, 8 ref.

Descriptors: *Geomorphology, *Networks, *River systems, Synthetic hydrology, Mathematical models, Stochastic processes, Streams.
Identifiers: Stream order, River networks, Topology.

Several stream ordering and labeling methods have been proposed in order to describe some aspects of the geometry of river networks; namely, Horton's, Strahler's, Milton-Ollier's, Scheidegger's ordering

techniques, and the STORET location coding system. This paper analyzes the topological significance of each of these methods, that is, the amount of information on the topological structure of the net that they can yield. Horton's and Strahler's ordering methods give only numerical information on the distribution of channels among different classes (orders); Milton-Ollier's and Scheidegger's methods give more information, from the topological point of view, as the former assigns a unique label to each stream segment in a network, and the latter takes into account all junctions; the STORET system labels interconnections between channels, but does not use the concept of order and is therefore more suitable for other purposes than for the theoretical study of river nets. (Knapp-USGS)
W69-04571

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02H.
W69-04574

DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
Geological Survey, Washington, D. C.
Hollis M. Orem.
Geol Surv Circ 550, 1968. 24 p, 4 fig, 12 tab, 4 ref.

Descriptors: *Streamflow, *Streamflow forecasting, *River flow, *Columbia River, Estimating, Washington, Oregon, Stream gages, Stage-discharge relations, Data collections, Average flow, Storage, Routing.
Identifiers: *Streamflow estimation, Lower Columbia River Basin.

Estimates of monthly and annual mean discharge for 5 ungaged sites in the lower Columbia River are presented for water years 1928-65. These sites are Columbia River at Vancouver, Wash, Willamette River at mouth, Columbia River at St. Helens, Oreg, Columbia River at Longview, Wash, and Columbia River at mouth. Two tables of estimates are compiled for each site. One table lists estimates of 'observed' flow, the flows that would be measured by a gaging station. The other table lists 'adjusted' flows, the 'observed' flows adjusted for storage changes in major reservoirs and for diversion at Grand Coulee Dam. Two methods are used in making these estimates. One method involves a detailed summation of flows from all gaged and ungaged areas, allowance for precipitation on and evaporation from the channel water surface and adjustment of flow to allow for travel time from gaging stations at the Dalles, Oreg (Columbia River main stem), and at Salem, Oreg (Willamette River). The other method is the same as the summation method except that flows from individual gaged and ungaged areas below the Dalles and Salem are not summed in detail. Instead, the entire drainage area below The Dalles is divided into 3 major inflow segments and the flow from each segment is obtained from a correlation with streams that are representative of the flow from that segment. Estimates of monthly mean flows are considered to be accurate within 2 or 3%. (Knapp-USGS)
W69-04577

PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
Carnigie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
Richard M. Shane, and Walter R. Lynn.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6329, pp 161-173, Jan 1969. 13 p, 6 fig, 2 tab, 4 ref, 4 append.

Descriptors: *Flood forecasting, *Statistical methods, Peak discharge, Probability, Statistical models, Base flow, Discharge (Water), Streamflow.
Identifiers: Probability density functions, Probability theory, Statistical analysis, Flood probability, Confidence limits.

Confidence limits along with a lower bound for the corresponding level of confidence are developed for evaluating the effect of the sampling error on flood risk evaluation from base-flow flood data. It is assumed that the number of flood peak occurrences is Poisson-distributed with exponentially distributed magnitudes. A confidence region is obtained for the Poisson and exponential distribution parameters from the asymptotic joint distribution of their maximum likelihood estimators. It is shown how this region can be used to obtain confidence limits for measures of risk which are calculated using the estimates. The limits are easy to calculate and, if desired, a graphical technique can be used. The technique is restricted, however, to situations where the base-flow record is sufficiently long so that the sampling distribution for the estimators can be approximated by a limiting normal distribution. (Knapp-USGS)
W69-04582

RIVER METAMORPHOSIS,
Colorado State Univ., Fort Collins. Dept. of Geology.
Stanley A. Schumm.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6352, pp 255-273, Jan 1969. 19 p, 2 fig, 1 tab, 25 ref, 3 append.

Descriptors: *Alluvial channels, *Erosion, *Sedimentation, *Channel morphology, Streams, Discharge (water), Rivers, Paleohydrology, Sediment transport, Geomorphology, Sediment yield, Sediment discharge, Regime, Shape, Slopes, Width, Meanders.
Identifiers: *River metamorphosis, Australia, Murrumbidgee River.

Data collected from stable alluvial rivers on the Great Plains of Western United States and on the Riverine Plain of southeastern Australia are used to demonstrate that channel width, depth, shape, meander wavelength, sinuosity and gradient are significantly related to the quantity of water and to the type of sediment load moving through these channels (ratio of bed-material load to total sediment load). Frequently during geologic time, complete alteration of river morphology (river metamorphosis) has occurred as a result of climate changes, whereas during historic time river metamorphosis occurs as a result of man induced variations of hydrologic regimen. Geologic and historic examples of river metamorphosis are used to support the empirical relations and to form the basis for deductions concerning the long-term reaction of a river system to man-induced changes of hydrologic regimen. (Knapp-USGS)
W69-04583

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02K.
W69-04586

WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
Geological Survey, Washington, D. C.
B. W. Thomsen, and H. H. Schumann.
Geol Surv Water-Supply Pap 1861, 1968. 53 p, 31 fig, 1 plate, 1 photo, 7 tab, 21 ref.

Descriptors: *Water resources, *Groundwater, *Surface water, *Arizona, Streamflow, Water wells, Water yield, Alluvium, Infiltration, Surface-groundwater relationships, Arid lands, Mountains, Evaporation, Floods.
Identifiers: Sycamore Creek watershed (Ariz), Maricopa County (Ariz), Aquifer tests.

The Sycamore Creek watershed is representative of many small watersheds in the southwest where much of the streamflow originates in the mountainous areas and disappears rather quickly into the alluvial deposits adjacent to the mountains. Five years of streamflow records from the Sycamore Creek watershed show that an average annual water yield of 6,110 acre-ft was obtained from the 165 sq mi (105,000 acres) of the upper hard-rock mountain area, which receives an average annual precipitation of about 20 inches. Only a small percentage of the annual water yield, however, reaches the Verde River as surface flow over the 9-mile reach of the alluvial channel below the mountain front. Flows must be more than 200 cfs to reach the river; flows less than this rate disappear into the lower alluvial area and are stored temporarily in the ground-water reservoir; most of this water is released as ground-water discharge to the Verde River at a relatively constant rate of about 4,000 acre-ft per year. Evapotranspiration losses in the lower alluvial area are controlled by the depth of the water table and averaged about 1,500 acre-ft per year. (Knapp-USGS)
W69-04587

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
Geological Survey, Austin, Tex.
H. L. Kunze, and J. N. Lee.
Tex Water Develop Board Rep No 86, Dec 1968. 27 p, 9 fig, 4 tab, 21 ref.

Descriptors: *Water quality, *Surface waters, *Texas, Streamflow, Runoff, Saline water, Duration curves.
Identifiers: Canadian River basin (Tex), Concentration-flow-duration curves.

The quality of water in streams of the Canadian River basin, Texas, is discussed and the basic data are tabulated. Most of the Canadian River tributaries that drain rocks of the Ogallala Formation of Tertiary age and Dockum Group of Triassic age generally contain water of good quality, with dissolved-solids concentrations less than 250 ppm. However, the 12,700 sq mi of the basin in the semiarid Texas Panhandle receives an average of only 19 in. of rainfall per year, of which less than 1 in. leaves the State as runoff. The water in the Canadian River, as it enters Texas from New Mexico, already contains more than 500 ppm dissolved solids; as the river flows across the Texas Panhandle, the dissolved-solids content progressively increases. The meager flows of streams with water of good quality from Ogallala and Dockum rocks are not sufficient to dilute natural saline inflows from Permian rocks and inflows of oil-field brines and municipal wastes. Most surface waters in the basin range from hard to very hard. Calcium, sodium, magnesium, and bicarbonate are the principal dissolved constituents in most streams. Lake Meredith, completed in 1965, is the only major surface-water supply in the basin. Lake Rita Blanca is used solely for recreation. Water from Lake Meredith will be used to supplement groundwater for municipal and industrial purposes. Water impounded in this lake, although usuable for public supply, is very hard and does not meet U. S. Public Health Service standards for dissolved-solids concentrations. During extended dry periods, the dissolved solids may approach 1,000 ppm. (Knapp-USGS)
W69-04593

GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02H.
W69-04597

TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO,
Geological Survey, Washington, D. C.
Daniel P. Bauer.
Geol Surv Circ 546, 1968. 15 p, 8 fig, 6 tab, 4 ref.

Descriptors: *Flow measurement, *Rivers, Flow rates, Discharge (water), Tracking techniques, Dye releases, Tracers, Ohio.
Identifiers: Time of travel (streamflow), Great Miami River, Dayton (Ohio), Cleves (Ohio).

A time-of-travel dye tracer study of the Great Miami River from Dayton to Cleves, Ohio, a distance of 71.3 river miles, was made in the summer of 1965 to obtain basic information about water passage. Cumulative traveltimes of 182 and 254 hr were determined for approximate discharges of 550 and 380 cfs, respectively, at Miamisburg. Peak traveltimes averaged 91% of the centroid traveltimes for the entire reach from Dayton to Cleves. Traveltimes computed from the so-called average-velocity method (discharge/cross-sectional area) were somewhat shorter for a given index discharge than the traveltimes determined for the centroid of the dye cloud. A method utilizing a straight-line log-log plot of traveltime versus index discharge to predict approximate traveltimes is stated. The resulting equation is limited to the approximate discharge range of 300-800 cfs. (Knapp-USGS)
W69-04598

COMPILATION OF HYDROLOGIC DATA, WALLER AND WILBARGER CREEKS, COLORADO RIVER BASIN, TEXAS-1966.
Geological Survey, Austin, Tex.

Prepared in cooperation with Texas Water Development Board. Geol Surv open-file basic-data rep, 1968. 31 p, 3 fig, 1 tab, 1 append.

Descriptors: *Data collections, *Streamflow, *Urbanization, Stream gages, Rainfall-runoff relationships, Texas, Hydrologic data, Water year, Small watersheds, Hydrographs.
Identifiers: Austin (Tex), Waller Creek (Tex), Wilbarger Creek (Tex), Urban hydrology.

Streamflow data are compiled for comparison of Waller Creek, an entirely urban stream in Austin, Texas, and Wilbarger Creek, in a geologically and topographically similar setting in a rural area, for urban hydrological studies. Data are tabulated on a regular daily basis and for individual storms for the water year 1966. Each stream gaging station record includes location, drainage area, availability of records, gage type, extreme flow events, remarks, and daily gage records for the year. Hydrographs are used to show storm rainfall-runoff relationships. (Knapp-USGS)
W69-04599

WATER TEMPERATURES IN THE LOWER COLUMBIA RIVER,
Geological Survey, Washington, D. C.
A. M. Moore.
Geol Surv Circ 551, 1968. 45 p, 11 fig, 21 tab, 2 ref.

Descriptors: *Water temperature, *Columbia River, Rivers, Streamflow, Nuclear powerplants, Thermal powerplants, Thermal pollution, Heated water, Washington, Oregon.
Identifiers: Lower Columbia River Basin.

Daily observations of water temperature for 20 sites in the lower Columbia River are presented in tabular form and in profile form by months for the period August 1941 to July 1942. The profiles show minimum, mean (average), and maximum water temperatures for those months from river mile 142 to river mile 6.7. The data indicate that water temperature in the lower river trends upward from October to March and has no marked trend, or trends downward, during April to September. Analysis of the water-temperature records at Bonneville Dam (river mile 146.1) for the 1938-66 period of records shows that the months from August 1941 to July 1942 are fairly representative of average conditions except for August and January, which are about 3 deg F above and 4 deg F below average, respectively. Analysis of the Bonneville Dam records also indicates that in the mid-1950's a man-caused change in water-temperature regimen occurred that resulted in higher temperatures at Bonneville Dam for 10 months of the year but no change in March and April. The changes for the other months ranged from 0.5 deg to +2.0 deg F. This menas that average temperatures for the lower river are now somewhat warmer for most months than temperatures shown in the profiles. (Knapp-USGS)
W69-04605

REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
Wyoming Univ., Laramie. Minuteman School of Civil Engineering.
James Otto Duguid.
Geophysics, Vol 33, No 3, pp 481-488, June 1968. 8 p, 5 fig, 2 tab, 5 ref.

Descriptors: *Seismic studies, *Water table, *Alluvium, Geophysics, Aquifers, Gravels, Sands, Seismic properties, Interfaces, Sediments.
Identifiers: Seismic refraction studies, Seismographs.

During an investigation of alluvium using a shallow refraction seismograph, time-distance curves obtained indicated two refraction interfaces. The shallower of the interfaces is the groundwater table, whose depth was obtained with an accuracy of 10%. The deeper interface is either the surface of the bedrock or the base of the weathered zone on the bedrock. If this lower interface is the surface of the bedrock, the velocity of seismic waves in the weathered material will be considerably lower than if the interface is the base of the weathered zone. (Knapp-USGS)
W69-04607

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
Geological Survey, Washington, D. C.
Conrad D. Bue.
Geol Surv Circ 539, 1967. 10 p, 3 fig, 15 ref.

Descriptors: *Floods, *Land use, *Publications, Flood forecasting, State-discharge relations, Zoning, Hydrologic data, Floodproofing, Non-structural alternatives.
Identifiers: Hydrologic atlases, Flood data reports.

The collection and analysis of flood data by the U. S. Geological Survey for use in flood plain planning and regulation is reviewed. A broad view of the flood program is presented with an explanation of the nature and use of the flood-inundation maps of the U. S. Geological Survey. Floods, which are normal natural phenomena, are catastrophic simply because man occupies flood plains in competition with rivers' needs for them as high-water channels. Neither complete evacuation of flood plains nor complete control of floods is practicable. To define the risk or cost of using flood plains, the U. S. Geological Survey flood reports are prepared. Flood-plain zoning, land-use zoning, floodproofing, flood forecasting, and types of flood publication available, are discussed briefly. (Knapp-USGS)
W69-04616

WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
State Planning Office, Santa Fe, New Mex.; and Geological Survey, Washington, D. C.
W. C. Ballance, Earl F. Sorenson, F. B. Titus, R. L. Borton, and W. A. Mourant.
N Mex State Planning Office Rep, 1967. 321 p, 46 fig, 4 plate, 63 tab, 229 ref.

Descriptors: *Water resources, *New Mexico, Data collections, Hydrologic data, Colorado River basin, Rio Grande, Arid lands, Geology, Groundwater, Surface water, Streamflow, Water yield, Water utilization, Water law, Prior appropriation, Water rights, Water sources.
Identifiers: Arkansas River, San Juan River, Pecos River.

New Mexico's water resources and water resource development are described. The water law of the State is based on prior appropriations to ensure orderly development. The utilization of water, streamflow, geology, groundwater hydrology, settlement and history, economics, agriculture, mining, and water problems of the State are described in reports on each of the State's drainage basins. The areas discussed in detail are the Arkansas River basin, Pecos River basin, Central closed basins, Rio Grande basin, Western closed basins, San Juan River basin, Lower Colorado River basin, and Southwestern closed basins. (Knapp-USGS)
W69-04627

THE AERATION CAPACITY OF STREAMS,
Geological Survey, Washington, D. C.
W. B. Langbein, and W. H. Durum.
Geol Surv Circ 542, 1967. 6 p, 4 fig, 2 tab, 9 ref.

Descriptors: *Reaeration, Dissolved oxygen, Streams, Turbulence, Waste assimilative capacity, Water circulation, Streamflow, Discharge (Water), Depth, Velocity.
Identifiers: Reaeration coefficient.

The equation usually used for calculating the rate of oxygen absorption in water involves the concentration of oxygen already in the water, the saturation concentration at the given temperature, time, and a coefficient of reaeration. The effects of river hydraulic properties on the coefficient of reaeration are studies. Experimental and field data indicate that the reaeration coefficient varies with the -1.33 power of depth and varies linearly with velocity, it decreases in the downstream direction with the 0.43 power of discharge, and it is smaller in larger rivers than in smaller rivers. With a change in discharge at a point on a river, the coefficient decreases with the 0.13 power of discharge. (Knapp-USGS)
W69-04628

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
Forest Service (USDA) Upper Darby, Pa. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W69-04636

2F. Groundwater

FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
Geological Survey, Washington, D. C.
Andrew M. Speiker.
Geological Survey Professional Paper 605-D, 1968. 15 p, 5 fig, 8 ref.

Descriptors: *Ground-water safe yield, *Groundwater recharge, *Ground-water overdraft, Industrial water, Consumptive use, Water pollution, Flow augmentation, Water-rights law, Interbasin transfer, Artificial recharge.
Identifiers: *Miami River Valley (Ohio), Cincinnatti (Ohio).

The valley-train sand and gravel aquifers of the Great Miami River valley below Dayton, Ohio, can be expected to yield an initial withdrawal of 300 million gallons per day-nearly three times their present rate of pumpage- provided that future developments are sufficiently distant from the present pumping centers. Most of the used ground water is returned to the river as sewage and could be recycled as induced recharge to the aquifers. This recycling would increase the total potential yield of the aquifers to much more than the initial withdrawal yield. The only limit on this recycling would be imposed by deterioration of quality of the used water or by the cost of treatment necessary to maintain adequate quality. Probably the greatest future problems will be declining ground-water levels and local overdraft, both resulting from in-

creased water use, ground-water contamination, and the application of existing law to situations involving water rights. Overdraft can best be avoided by careful spacing of future ground-water developments and location of these supplies in favorable hydrogeologic environments. Reuse of water by industry is an alternative to developing new supplies, for it can materially reduce water consumption. Ground-water contamination, most of which is derived from water induced from streams by pumping, can best be controlled by maintaining water of good quality in the streams. Plans for management of the ground-water resource should include careful consideration of the close interrelation of surface water and ground water.
W69-04206

SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 04B.
W69-04231

HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W69-04234

VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
University Coll. of Wales, Aberystwyth. Dept. of Physics.
W. M. Jones.
Brit J Appl Phys (J Phys D), Ser 2, Vol 1, No 11, pp 1559-1565, Nov 1968. 7 p, 4 fig, 13 ref.

Descriptors: *Flow, *Flow characteristics, *Porous media, *Fluid friction, Flow resistance, Viscous flow, Reynolds number, Darcys law, Capillary action, Permeability, Interstices.
Identifiers: Viscous drag, Non-Darcian flow, Secondary flow.

Departure from Darcy's law in the flow of fluids through granular beds can be interpreted as due to a regular secondary flow being set up. Experiments are described which establish a single non-dimensional curve to describe the results of the flow of air and of liquids through granular beds of spheres and of irregular particles. The model of a granular bed is discussed and experiments are described which establish the identify of the flow through helices with that through the same cylindrical tubes bent into coplanar S shapes. An equation is given relating the resistance of a granular bed to the flow through it when Darcy's law is no longer applicable.
W69-04243

ILLINOIS GROUND WATER POLLUTION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W69-04256

CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
Illinois Univ., Urbana. Dept. of Agronomy.
Allen R. Overman.
Work supported by Dept of Interior, under Office Water Resources Res. Soil Sci Soc Amer Proc, Vol 32, No 5, pp 616-618, Sept-Oct 1968. 3 p, 2 fig, 2 tab, 7 ref.

Descriptors: *Diffusion, *Ion transport, *Clays, Dispersion, Convection, Mass transfer, Bentonite, Solutes.
Identifiers: Mass flow, Convective diffusion.

The theory of convective diffusion has been applied to transport of salt through clay columns. An expression was derived for salt distribution with the column for steady state conditions. Data from the literature were used to test the applicability of the distribution function to clay systems. The observed nonlinearity is described to high precision by the equation. However, some discrepancy occurs between calculated and measured parameters. (Knapp-USGS)
W69-04261

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
Geological Survey, Washington, D. C.
Roy Newcome, Jr.
Geol Surv Water-Supply Pap 1839-H, pp H1-H28, 1967. 28 p, 11 fig, 1 plate, 3 tab, 11 ref.

Descriptors: *Water utilization, *Water quality, *Groundwater, Hydrology, Mississippi, Cooling, Industrial plants, Potable water, Aquifers, Wells, Pumping.
Identifiers: NASA project.

To insure that the large amount of water required during short periods of time for Saturn V rocket test-stand deflector cooling is available and to provide information for guidance in well construction and well spacing, a study of the groundwater resources of the Mississippi Test Facility and surrounding buffer zone was made. Potable and industrial water supplies are obtained from large-capacity wells, and the fresh-water-bearing section is up to 3,000 ft thick. Three wells for potable water have produced 1,100 to 2,500 gpm by natural flow. Water for cooling the deflectors is from 3 wells that are capable of supplying 18 mgd. Water from the supply wells is a sodium bicarbonate type with high pH, ranging in temperature from 79 deg F to 100 deg F. Artesian head on the deepest well is 104 ft above land. (Llaverias-USGS)
W69-04268

GEOCHEMISTRY OF EPIGENESIS,
Akademiya Nauk SSSR. Institut Geologii Rudnykh Mestorozhdenii, Petrografii, Mineralogii i Geokhimii.
For primary bibliographic entry see Field 02K.
W69-04274

FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
Utah State Univ., Logan. Dept. of Civil Engineering.
Roland W. Jeppson.
Research supported by National Science Foundation. ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6364, pp 363-381, Jan 1969. 19 p, 8 fig, 12 ref, append. Grant GK-1478.

Descriptors: *Flow, *Porous media, *Anisotropy, Seepage, Infiltration, Canal seepage, Flow nets, Approximation method, Mathematical models, Digital computers, Computer programs, Groundwater movement, Soil water movement.
Identifiers: Heterogeneous porous media, Finite difference methods.

Methods are developed for obtaining finite difference solutions to steady-state, free-surface saturated seepage flows through nonhomogeneous porous media. The formulation considers the total fluid head and the stream function as the independent variables and the coordinates x and y as the dependent variables. In the plane defined by the total fluid head and the stream function free surfaces are straight lines and the region of seepage is rectangular if no surfaces of seepage are present. The variation in permeability of the porous media can be specified by continuous functions. The methods are applied to obtain solutions to problems of seepage from canals through nonhomogeneous porous media to a drained layer at some specified depth. Several representative flownets from these solutions are presented. (Knapp-USGS)
W69-04552

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
Geological Survey, Salt Lake City, Utah.
R. M. Cordova, L. J. Bjorklund, R. G. Butler, R. W. Mower, and L. R. Herbert.
Utah Div Water Resources Coop Invest Rep No 6, Oct 1968. 105 p, 56 fig, 4 tab, 6 ref.

Descriptors: *Water resources, *Groundwater, *Data collections, *Utah, Hydrologic data, Aquifers, Water quality, Water level fluctuations, Water yield, Water utilization.
Identifiers: *Periodic observations, State water plan.

The groundwater conditions in Utah in the spring of 1968 are compiled and analyzed. Information is presented on well construction, groundwater withdrawals, water-level changes, and related changes in precipitation and streamflow. Graphs show chemical quality of water. Maps show water table configuration. Most areas of important groundwater withdrawal are discussed. Areas of potential large groundwater development are discussed and mapped. Less than 2% of the Utah wells obtain water from consolidated rock, mostly lava flows, limestone, and sandstone. The remaining 98% are in gravel, sand, silt and clay in large intermountain alluvial basins. The estimated 1967 total withdrawal of groundwater was about 650,000 acre-ft, 79,200 for irrigation, 11,700 for industry, and 9,400 for public supply. The 1967 precipitation was 0.45-2.82 inches above normal, and combined with less than usual withdrawal, resulting in a general water level rise. (Knapp-USGS)
W69-04561

GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
Geological Survey, Lansing, Mich.
C. J. Doonan, and G. E. Hendrickson.
Mich Geol Surv Water Invest Rep No 8, 1968. 22 p, 5 fig, 2 map, 5 ref, 1 append.

Descriptors: *Groundwater, *Water resources, Michigan, Water wells, Water quality, Hydrologic data, Water yield, Glacial drift, Domestic water, Municipal water, Data collections.
Identifiers: Gogebic County (Mich).

The groundwater resources of Gogebic County, Michigan, are described. Information on representative wells and springs is tabulated. A geologic map is included. Most of the aquifers in the county are beds of sand and gravel in glacial drift, but some wells obtain small quantities of water from fractured bedrock. The County's groundwater resources are neigher abundant nor evenly distributed. Well yields of several hundred gal/min are available in a few small areas, but over most of the county, well yields are small to moderate, and in some areas the relatively small amount needed for a domestic supply is difficult or impossible to obtain. The most favorable areas for obtaining large supplies of water from wells are sand and gravel deposits along streams. Least favorable are areas where the Precambrian bedrock is exposed or is covered by only a few feet of glacial drift. Most wells are drilled, and about half of them are between 50 and 100 ft deep. Wells deeper than 200 ft usually fail because of small yields or poor quality of water. Water from most wells and springs is moderately hard, and some wells and springs yield water with objectionable amounts of iron. Public water supplies are obtained from wells, springs and an abandoned mine. Groundwater resources may be inadequate to meet the needs of expanding population or industry in many places in the county. Lakes and streams are potential alternate sources. Long-term records of streamflow, groundwater levels, lake levels, and quality of water will be needed for making informed management decisions. (Knapp-USGS)
W69-04564

A NOTE ON THE GHYBEN-HERZBERG FORMULA,
Technische Hogeschool, Delft (Netherlands).

Arnold Verruijt.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 43-46, Dec 1968. 4 p, 2 fig, 3 ref.

Descriptors: *Saline water-freshwater interfaces, *Aquifers, *Coasts, Groundwater movement, Flow nets, Discharge (Water), Steady flow.
Identifiers: Coastal aquifers, Ghyben-Herzberg formula.

A generalized form of the Ghyben-Herzberg formula is derived to account for the position of the saline-freshwater interface in an unconfined coastal aquifer when fresh-water potential lines are not vertical. In the case of negligible seaward flow the formula reduces to the Ghyben-Herzberg formula, and when flow is rapid, the formula gives good results at a long distance in land, relative to the product of discharge and permeability (a length term). (Knapp-USGS)
W69-04569

PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
Geological Survey of India, Hyderabad.
T. N. Narasimhan.
Bull Int Ass Sci Hydrol, Vol 13, No 4, pp 91-105, Dec 1968. 15 p, 6 fig, 3 tab, 7 ref.

Descriptors: *Drawdown, *Water wells, Alluvium, Pumping, Theis equation, Water level fluctuations, Aquifers, Withdrawal.
Identifiers: *Papadopulos-Cooper method, Large-diameter wells, Well storage, India, Palar River, Pumping tests, Aquifer testing.

The non-equilibrium formula of Theis has hitherto been found to be inadequate to analyse drawdown data from open wells, due to the influence of effects of well-storage on early drawdown data. Recently, a reliable type-curve method was proposed by Papadopulos and Cooper to analyse drawdowns in wells of large diameter. In order to study its practical validity, the Papadopulos-Cooper method was applied to drawdown data from 6 open wells in alluvial sands of the river Palar, near Madras City, India. The study has indicated that the method has considerable practical utility in analysing drawdown data from large diameter open wells. Besides, the method also offers an easy way of computing the duration over which the effects of well-storage are likely to influence drawdown data, in terms of aquifer transmissibility and well-radius. If a rough idea of aquifer transmissibility is available from existing data, then, such a computation, to determine the duration over which wellstorage affects drawdown, could be initially made to advantage, so that proper judgement could be exercised in using other conventional methods of analysis, such as that of Jacob or that of Theis. (Knapp-USGS)
W69-04573

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02H.
W69-04574

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
Illinois State Geological Survey, Urbana.
Keros Cartwright.
Ill State Geol Surv Circ 433, 1968. 41 p, 27 fig, 4 tab, 44 ref.

Descriptors: *Groundwater, *Aquifers, *Glacial drift, *Geothermal studies, *Exploration, Mapping, Surveys, Illinois.
Identifiers: Geothermal groundwater prospecting.

Theoretical considerations of the thermal properties of glacial and alluvial deposits in Illinois suggest that a shallow aquifer might form a heat sink (or source) that would influence the temperature of the overlying soil. If shallow aquifers are nonuniformly distributed laterally, and if their effects on the temperatures of surface soil can be measured and distinguished from other factors that affect soil temperature, a possible exploration method for shallow aquifers is suggested. A positive (warm) anomaly would be expected over such aquifers in the winter and a negative anomaly in the summer. The size of the anomalies is dependent upon the thermal properties of the overburden, temperature difference between the surface and aquifer, and the depth of burial of the aquifer. A thermister at the end of an aluminum-tipped stake was used to measure soil temperatures at a depth of about 18 in. in 7 areas in Illinois where shallow aquifers were known in some detail. Maximum anomalies of about 2 deg C are present over the aquifers. Summer anomalies generally are of greater magnitude than winter anomalies. Soil differences, vegetation, and ice in the soil also affect the soil temperatures. The effect of vegetation in the summer can be as great as the anomaly produced by an aquifer. Frozen soil tends to eliminate anomalies, but this effect can be partly overcome by taking readings at a greater depth. Field data show close agreement between the location of shallow aquifers and thermal anomalies. (Knapp-USGS)
W69-04585

WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04587

GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02H.
W69-04597

RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
Saint Louis Univ., St. Louis, Mo.
S. A. Vincenz.
Geophysics, Vol 33, No 6, pp 980-994, Dec 1968. 15 p, 21 fig, 1 tab, 23 ref.

Descriptors: *Hydrogeology, *Karst, *Aquifers, *Resistivity, *Surveys, Geophysics, Electrical studies, Permeability, Porosity, Water yield, Water wells, Irrigation water, Limestones.
Identifiers: *Jamaica, Pumping tests.

Resistivity depth probes were made over water wells in an alluvial interior valley of Jamaica, known as the Queen of Spain's Valley. Several types of electrode configuration were used and the observations analyzed by a technique designed to select those suitable for interpretation. The results, interpreted by standard curve matching methods, compare favorably with available well logs. They suggest that the yield is a linear function of the resistivity of the water-bearing strata. A straight line fitted to the data by the method of least squares provides a nomogram which can be used for predicting the probable yield at points where no wells exist. It is concluded that resistivity surveys can be of material assistance in a water-supply drilling program in the area. It is found that interpretation by multilayer curve-matching procedures gives more realistic results than analysis by classical two-layer master curves used in conjunction with Hummel's rule. The results suggest also that the Wenner array gives a better resolution of small resistivity contrasts than the operationally more versatile Cooper array. A conclusion of more general nature states that Helmholtz' reciprocity theorem of electrical conduction holds also for rock media. (Knapp-USGS)
W69-04600

CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
Geological Survey, Denver, Colo.
Edward A. Sammel.
Geophysics, Vol 33, No 6, pp 1004-1012, Dec 1968. 9 p, 8 fig, 12 ref.

Descriptors: *Borohole geophysics, *Convection, *Wells, Water circulation, Heat transfer, Geothermal studies, Heat flow, Thermal properties.
Identifiers: Small-diameter wells, Thermal gradient.

Critical thermal gradients for the onset of convection in small-diameter wells are computed and are shown graphically for water of several salinities and for glycerol. A series of field and laboratory tests in wells with diameters of 4.8 cm and 10.2 cm showed that water columns are unstable at temperature gradients as low as 0.003 deg C/m. Magnitudes of thermal oscillations at higher gradients were as large as 0.49 deg C, and apparent sizes of convection cells ranged up to 210 cm in height in a 10.2 cm cylinder and to 48 cm in wells 4.8 cm in diameter. Comparison of temperatures in adjacent wells showed temperature differences as great as 3 deg C when thermal gradients were greater than the theoretical critical gradients. It is concluded that temperatures in the upper zone of deep wells may depart widely from ambient temperatures in the formations penetrated. (Knapp-USGS)
W69-04601

ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
California Univ., Berkeley. Dept. of Mineral Technology.
Rene Bodmer, S. H. Ward, and H. F. Morrison.
Geophysics, Vol 33, No 5, pp 805-821, Oct 1968. 17 p, 17 fig, 22 ref. WRC Project - W114, OWRR-B-002-CAL.

Descriptors: *Electrical studies, *Geophysics, *Groundwater, Geochemistry, Surveys, Resistivity, Clays, Gravels, Hydrologic data, Aquifers, Hydrogeology, Hydrologic properties, Artificial recharge, Pit recharge, California.
Identifiers: Induced polarization anomalies, Electrical surveys, Potential surveys, Santa Clara County (Cal).

Clay horizons and other clay-bearing unconsolidated sediments are potential sources of induced-polarization anomalies. If such anomalies may be detected above system noise, the induced-polarization method may be of value for in-situ classification of unconsolidated sediments encountered in hydrological projects. One such project exists in Santa Clara County where near-surface unconsolidated sediments are frequently considered as potential recharge areas. Of four areas surveyed with induced-polarization apparatus in Santa Clara County, only 2-yielded significant frequency-effect anomalies, and in each of these 2 the frequency effects were of the order of 3%. These anomalous frequency effects may be related to clayey gravels. The dipole-dipole array, with spreads of 10 ft and 20 ft was typically used in the study. (Knapp-USGS)
W69-04606

SALINE GROUND WATER IN LOUISIANA,
Geological Survey, Washington, D. C.
A. G. Winslow, D. E. Hiller, and A. N. Turcan, Jr.

Geol Surv Hydrol Invest Atlas HA-310, 4 sheets, 1968. 5 map, 4 tab, 4 ref.

Descriptors: *Saline water, *Groundwater, *Louisiana, Water resources, Saline water-freshwater interfaces, Water chemistry, Water quality, Water yield, Water temperature, Water wells, Gulf coastal plain.
Identifiers: *Saline water resources.

Data are presented on the occurrence and distribution of saline groundwater in Louisiana. The areal

and vertical extent of subsurface zones of saline waters are shown and typical chemical analyses are tabulated. Approximate altitudes, estimated yields, and thicknesses of saline-water aquifers are shown by maps. (Knapp-USGS)
W69-04608

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
Geological Survey, Washington, D. C.
R. L. Hosman.
Geol Surv Hydrol Invest Atlas HA-309, 1 sheet, 1969. 3 map, 3 tab, text.

Descriptors: *Water resources, *Hydrogeology, *Groundwater, *Gulf coastal plain, *Arkansas, Water yield, Aquifers, Artesian wells, Water quality.
Identifiers: Aquifer testing, Pumping tests.

Data on water quality, water wells, and character and extent of the Gulf Coastal Plain system of aquifers in Arkansas are summarized in a 1-sheet hydrological atlas consisting of block diagrams showing stratigraphy and extent of aquifers, water chemical quality diagrams, and tables. The hydrological characteristics of the principal aquifers are described and a summary of pumping test results is given. The altitude of the base of fresh water is shown by a map. (Knapp-USGS)
W69-04609

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
Geological Survey, Washington, D. C.
L. F. Emmett, and H. G. Jeffery.
Geol Surv Hydrol Invest Atlas HA-315, 1 sheet, 1968. 2 map, 2 graph, 1 tab, 16 ref.

Descriptors: *Water resources, *Groundwater, *Alluvium, *Missouri River, *Missouri, Water wells, Water yield, Transmissivity, Permeability, Water quality, Irrigation, Industrial water, Municipal water, Domestic wastes.
Identifiers: *Missouri River alluvium.

The groundwater resources of the Missouri River alluvium in eastern Missouri are shown by a map, cross sections, tables, and graphs. Most of the abundant groundwater in the alluvium is unused. There are no municipal well fields in the area. The only large capacity wells are a few irrigation and industrial wells. The average thickness of the alluvium is about 100 feet, of which 80 feet is saturated with water. A pumping test showed a transmissibility of 27,000 gpd per ft and a permeability of about 3,000 gpd per sq ft. The alluvial water is a calcium bicarbonate type with significant amounts of magnesium and sulfate, very hard, with a high iron content. (Knapp-USGS)
W69-04610

GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
Geological Survey, Washington, D. C.
H. E. LeGrand.
Geol Surv Circ 538, 1967. 11 p, 12 fig, 2 tab.

Descriptors: *Water wells, *Water yield, *Estimating, Topography, Soils, Depth, Permeability, Transmissivity, Fractures (Geology), Hydrogeology, Groundwater movement.
Identifiers: Blue Ridge province, Piedmont province.

A scheme is presented for estimating potential well yields in the Blue Ridge and Piedmont physiographic provinces of the U. S. by site evaluation based on topography and thickness of soil. Because the area's bedrock is relatively impermeable, high-yield wells are common where thick residual soils and low topographic areas are together, and low-yield wells are in thin soil on hilltops. Tables are given for use in assigning point values to soil and topographic conditions. The point value is then used in a probability chart to estimate the chances of obtaining various well yields. Groundwater quality and the general principles of groundwater hydrology, particularly as they apply to the Piedmont and Blue Ridge provinces, are discussed. (Knapp-USGS)
W69-04615

THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
Agricultural Research Service, Fresno, Calif. Soil and Water Conservation Research Div.
E. E. Haskell, Jr. and W. C. Bianchi.
Ground Water, Vol 5, No 4, pp 12-17, Oct 1967. 6 p, 7 fig, 4 tab, 10 ref.

Descriptors: *Geohydrologic units, *Geologic investigation, Irrigation wells, Electrical well logging, Water table, Alluvium, Underground structures, Hydraulic properties, Core drilling, Permeability, California.
Identifiers: *Geophysical studies, Perched water layers, Fresno County (Calif).

A shallow wide-spread perching layer was isolated in the alluvial profiles of western Fresno County, California. Field and laboratory investigations, using electrical well logging and geological surveys, gave considerable data on the physical and hydrologic properties of this perched layer and on the rate of flow associated with the layer. As a result of this investigation the hydraulic properties and descriptions for the perched zones are presented which can be used to delineate profile flow limitations at other locations in the San Joaquin Valley. This study may be used in estimating the rate at which this perched water table could rise under new management conditions of irrigation and commercial water use involving imported water. (Gabriel-USGS)
W69-04619

TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
Geological Survey, Jacksonville, Fla., and Geological Survey, Ocala, Fla.
G. W. Leve, and D. A. Goolsby.
Ground Water, Vol 5, No 4, pp 18-22, Oct 1967. 5 p, 7 fig, 1 tab, 1 ref.

Descriptors: *Groundwater, *Hydrologic aspects, *Geologic investigation, *Aquifers, Artesian wells, Electrical well logging, Electrical studies, Core drilling, Water quality, Water analysis.
Identifiers: Floridan aquifer, Jacksonville (Fla).

A deep (2500') well was drilled at Jacksonville, Florida to obtain geologic and hydrologic information on the deeper and unexplored part of the Floridan aquifer. The study shows that the aquifer consists of a series of water-producing zones separated by nonproductive zones. A new fresh-water producing zone and the fresh water-salt water contact was delineated. The well was completed in three separate zones in order to detect any salt-water encroachment. The article describes the technique and results of drilling the test well. (Gabriel-USGS)
W69-04620

THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
Idaho Univ., Moscow.
R. E. Williams.
Ground Water, Vol 5, No 4, pp 23-26, Oct 1967. 4 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Highways, *Road construction, *Concretes, *Paving, *Stability, *Groundwater, *Flow, Flow control, Precipitation (Atmospheric), Rainfall, Zone of saturation, Ice, Illinois, Air-water interfaces.
Identifiers: Northeastern Illinois.

The failure or 'breaking up' of pavements in cuts in glacial till are commonly associated with the periods of significant groundwater recharge when such periods are concomitant with freezing and thawing. These failures were investigated in northeastern Illinois. The investigation consisted of recording precipitation and water levels, as recorded by the piezometers, during the year of 1965 and January and February of 1966. The study shows that the cuts in glacial till and of appreciable depth intersect the zones of saturation and establish local gravity, groundwater flow systems with the bottom of the cut acting as a groundwater discharge zone. Such shallow gravity flow system may bring about pavement failure by facilitating the growth of ice lenses or by developing high pressure beneath the pavement. (Gabriel-USGS)
W69-04621

TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
Indiana Univ., Bloomington. Dept. of Geology.
Y. M. Sternberg.
Ground Water, Vol 5, No 4, pp 27-29, Oct 1967. 3 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, *Aquifers, *Pump testing, Discharge measurement, Synthetic hydrology, Model studies, Analytical techniques, Analysis, Aquifer characteristics.
Identifiers: *Aquifer transmissibility.

A rapid graphical technique for the determination of aquifer transmissibility from a variable discharge pumping test is presented. The technique is based on the Aron (1965) graphical solution for aquifer characteristics and detailed mathematical analysis of variable aquifer discharges developed by the author. The technique requires the following data: the variation of discharge with time during the pumping test and a record of an observation well after the well was shut off. The article contains an example of using some synthetic well-data, 18 formulas, tables and figures. (Gabriel-USGS)
W69-04622

DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 06B.
W69-04623

A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 07C.
W69-04624

GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
Geological Survey, University, Ala.
Kenneth D. Wahl.
Ala Geol Surv Bull 86, 1966. 93 p, 11 fig, 2 plate, 7 tab, 29 ref.

Descriptors: *Alabama, *Hydrogeology, *Aquifer characteristics, Geologic formations, Geologic mapping, Structural geology, Water chemistry, Water quality, Chlorides, Iron, Contours, Depth.
Identifiers: Greene County, Coker Formation, Gordo Formation, McShan Formation, Eutaw Formation, Mooreville Chalk, Demopolis Chalk.

The report provides groundwater information on where water is available, how much individual wells produce, what the chemical quality of the water is, how much water is utilized, what problems are present or anticipated, and the steps necessary to

solve them. Groundwater is available from sand and gravel aquifers in the Coker, Gordo, McShan, and Eutaw Formations and in the alluvial deposits. The Mooreville and Demopolis Chalks are relatively impermeable and are not sources of groundwater, although they do confine water in underlying aquifers and limit downward percolation. More than 1,000 gpm can be obtained from the Coker, Gordo, and McShan Formations. Supplies adequate for domestic or stock use can be made in alluvial deposits and Eutaw Formation. Large capacity wells can be constructed in lower terrace deposits and alluvium along major streams. Groundwater use in Greene County in 1965 was 1,150,000 gpd, with 840,000 gpd supplied from the McShan Formation. Flow from 111 wells in 1965 was 2,740,000 gpd, more than double the groundwater use. Quality-of-water from the Coker Formation is generally satisfactory but may be too mineralized for some industrial uses and the water from it has excessive hardness and chloride in the south of the county. Quality of water from the Gordo, McShan, and Eutaw Formations is good to poor. Excessive iron present in the waters can be filtered or treated or another source located. If chloride content is high, another source should be sought. Figures show contours related to major aquifers in the Coker, Gordo, and McShan Formations. Distribution of iron in water is shown for the Coker, Gordo and McShan--Eutaw Formations. Distribution of chloride is shown for the Gordo and McShan Formations. A geologic map and hydrogeologic section are included. Tables give records of selected wells, partial and comprehensive chemical analyses, lithologic and drillers' logs, geologic units and their hydrologic properties, and summary of groundwater use and flow in 1965. (Vorhis-USGS)
W69-04625

WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
State Planning Office, Santa Fe, New Mex.; and Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04627

2G. Water in Soils

HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
David L. Sturges.
Soil Sci, Vol 106, No 4, pp 262-264, 1968. 3 p, 2 fig, 1 tab, 5 ref.

Descriptors: *Peat, *Hydraulic conductivity, *Bulk density, *Moisture tension, Marshes, Soil types, Permeability, Porosity, Pores, Soil water movement, Porous media, Groundwater movement, Soil physical properties, Bogs.
Identifiers: Bulk wet density, Peat hydraulic properties.

Field and laboratory measurements were made of the hydrologic characteristics of peat from a mountain bog in Wyoming. Samples were taken at 0-13 and 13-25 cm in moderately decomposed peat and 36-48 cm in decomposed peat. The bulk density of the 0-13 cm sample was 0.160 g/cc, of the 13-25 cm sample 0.28 g/cc, and of the 36-48 cm sample, 0.216 g/cc. Water yields were 0.223 cc/cc at 0.10 bar suction and 0.50 cc/cc at 1.00 bar in the 0-13 cm sample, 0.140 cc/cc at 0.10 bar and 0.458 cc/cc at 1 bar in the 13-25 cm sample, and 0.076 cc/cc at 0.10 bar and 0.349 cc/cc at 1.0 bar in the 36-48 cm sample. Both bulk wet density and water retention were related to the degree of decomposition and to the pore size distribution; surface peat contained large voids which emptied at low suction and the more decomposed deeper peat had smaller pores which required greater suction to empty. In situ hydraulic conductivity was 0.0239 at 46 cm depth and 0.0161 at 91 cm. (Knapp-USGS)
W69-04234

WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
Rothamsted Experimental Station, Harpenden (England).
D. A. Rose.
Brit J Appl Phys (J Phys D), Ser 2, Vol 1, No 12, pp 1779-1791, Dec 1968. 13 p, 5 fig, 30 ref.

Descriptors: *Soil water movement, *Evaporation, *Saturation, *Porous media, Soils, Soil physical properties, Soil properties, Soil physics, Laboratory tests, Capillary action, Compaction, Drainage effects, Hydrologic properties, Permeability, Wettability, Hysteresis.
Identifiers: Vertical flow equation.

A vertical flow equation is adapted to describe the evaporation of water from a semi-infinite porous medium during the second stage of drying when water loss is limited by the distribution of water in the material. Flow measurements on long columns of aggregates of 6 soil materials confirm the theory, and enable the transport parameters controlling flow to be found over the range of water content from aggregate saturation to dryness (i.e. from near pF 2 to near pF 7). Evaporation from porous media initially at a uniform water content shows a saturation profile for each material which is invariant with the product of depth and the square root of elapsed time. As saturation decreases, diffusitivities calculated from these profiles fall to a minimum and rise to a subsidiary maximum close to dryness, before falling again as saturation approaches zero, in accordance with theoretical prediction. Hydraulic conductivities fall continuously as saturation decreases. (Knapp-USGS)
W69-04242

EFFECTS OF SOIL FREEZING ON WATER YIELDS,
Colorado State Univ., Fort Collins; and Forest Service, Washington, D. C.
For primary bibliographic entry see Field 02C.
W69-04251

INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W69-04258

CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 02F.
W69-04261

MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
Agricultural Research Service, Beltsville, Md.
H. N. Holtan, C. B. England, G. P. Lawless, and G. A. Schumaker.
Agr Res Serv, ARS Ser 41-144, Oct 1968. 609 p, 1 fig, 2 tab.

Descriptors: *Soil moisture, *Moisture tension, *Data collections, Soil types, Soil analysis, Soil investigations, Soil groups, Soils, Soil water, Demonstration watersheds, Experimental farms.
Identifiers: Experimental watersheds.

Moisture retention and conductivity data used in an effort to determine the influence of soils upon the hydrologic performance of agricultural watersheds are presented. Soils were sampled to represent approximately 200 Agricultural Research Service (ARS) experimental watersheds or plats at 34 locations in 23 States. Watersheds or plots were selected for length of hydrologic record and for least complexity of soils and land use. Sampling and testing were designed specifically to provide a basis for computing watershed capacities for rainfall retention and may not strictly adhere to the methods used by the Soil Conservation Service (SCS) for soil classification. The data are released as an inducement toward deterministic hydrology in watershed engineering and not as a study of soil genesis. Each record consists of a complete description of the soil and the sampling locality including location, vegetation and land use, topography, drainage, parent material, and a detailed description of all soil horizons sampled. The moisture data include weight percent of retained water, volume percent of retained water, and moisture tension. (Knapp-USGS)
W69-04266

GEOCHEMISTRY OF EPIGENESIS,
Akademiya Nauk SSSR. Institut Geologii Rudnykh Mestorozhdenii, Petrografii, Mineralogii i Geokhimii.
For primary bibliographic entry see Field 02K.
W69-04274

SILICA IN STREAMS AND GROUND WATER OF HAWAII,
Hawaii Univ., Honolulu.
Stanley N. Davis.
Hawaii Water Resources Research Center, Tech Rpt No 29, Jan 1969. 31 p, 2 fig, 10 tab, 28 ref. OWRR Project B-010-HI.

Descriptors: *Silica, *Soil leaching, Ground-water recharge, *Surface runoff, Surface water, *Subsurface runoff, *Weathering.

Concentrations of silica in natural waters of Hawaii vary from less than 0.2 ppm in rain water to almost 90 ppm in ground water. The acquisition of silica by the water is probably most rapid near the ground surface. Between 1 and 3 ppm will go into solution within a few minutes after rain comes in contact with the rock and soil. Rain water that percolates to the subsurface and eventually becomes groundwater recharge will have from 5 to 20 ppm silica before it reaches high-level dike compartments. The high-level water will continue to dissolve more silica until it has from 15 to 45 ppm silica. Some of the dike water will discharge into streams which in turn recharge the basal-water body and some will leak directly into the basal-water body. Basal water that may start with 25 to 45 ppm silica will slowly dissolve more silica until it contains from 30 to 60 ppm. Concentrations of more than about 40 ppm appear to be correlated with irrigation return water and in addition may be owing to dissolution of less weathered rocks in the more arid parts of Oahu as well as the other islands of Hawaii. Rates of silica removal in small watersheds of the high-rainfall portions of the Koolau Range appear to be as much as 8 mg/sq. cm/yr, which is more than any other area in the United States.
W69-04528

FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W69-04552

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS: 1. WATER RETENTION,
Hawaii Univ., Honolulu. Water Resources Research Center; and Hawaii Univ., Honolulu, Dept. of Agronomy and Soil Science.
M. L. Sharma and G. Uehara.
Soil Sci Soc Amer Proc, Vol 32, No 6, pp 765-770, Nov-Dec 1968. 6 p, 10 fig, 2 tab, 19 ref.

Descriptors: *Soil water, *Moisture tension, *Soil structure, Tensiometers, Moisture content, Soil physics, Percolation, Temperature, Unsaturated flow, Particle size, Porosity, Capillary water.
Identifiers: *Water retention, Pore size distribution, Macrofabric, Microfabric, Latosols.

Experiments were carried out to study the effect of 2 aspects of soil structure, macrofabric and microfabric, on the water retention characteristics of 2 latosolic soils. The soils were selected because of similarity in composition but differences in structure. Moisture retention curves of the soils and also of their water stable aggregates were obtained. On the basis of results it was concluded that for strongly structured soils, water retention was greatly influenced by macrofabric in the tension range between 0 to 0.3 bar, while the effect of microfabric was more prominent beyond this range. The influence of microfabric was also demonstrated by applying the surface tension, radius of curvature, pressure relationship on selected aggregate fractions. (Knapp-USGS)
W69-04588

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS: 2. WATER MOVEMENT,
Hawaii Univ, Honolulu. Water Resources Research Center; and Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
M. L. Sharma and G. Uehara.
Soil Sci Soc Amer Proc, Vol 32, No 6, pp 770-774, Nov-Dec 1968. 5 p, 6 fig, 15 ref.

Descriptors: *Soil water movement, *Soil structure, Saturated flow, Unsaturated flow, Moisture tension, Capillary water, Soil water, Moisture content, Percolation, Temperature, Particle size, Porosity.
Identifiers: Macrofabric, Microfabric, Pore size distribution, Latosols.

Experiments were carried out to study the effect of 2 aspects of structure, macrofabric (arrangement of peds) and microfabric (arrangement of primary particles within the ped), on water movement. Two latosolic soils of nearly similar composition and varying greatly in soil fabric were used. Capillary conductivity of the soils and their water-stable aggregates were obtained. The results showed that the effect of macrofabric on water movement was more pronounced in the low-tension range (0-0.2 bar). Identical flow rates were obtained for the same size water stable aggregates of both soils, suggesting that intra-ped pores did not significantly contribute to water flow in this tension range. It was suggested, however, that microfabric might influence fluid flow properties in the high tension range. (Knapp-USGS)
W69-04589

THE DRYING THROUGH THE TOP SURFACE OF A VERTICAL POROUS COLUMN,
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
J. P. Heller.
Soil Sci Soc Amer Proc, Vol 32, No 6, pp 778-786, Nov-Dec 1968. 9 p, 10 fig, 12 ref.

Descriptors: *Drying, *Porous media, Evaporation, Moisture tension, Darcys law, Unsaturated flow, Saturated flow, Soils, Capillary action, Diffusion, Drainage, Infiltration, Permeameters.
Identifiers: Haines jump, Stefan problem, Drying front.

Microscopic and macroscopic descriptions are given of the process of drying from a long porous and permeable column, initially saturated fully with a liquid which wets its grains. A comparison is made with the process of drainage, and it is shown that the 'first stage of drying' corresponds with the extension down into the pack of a saturation profile derived from the capillary pressure curve. In the second stage of drying this profile penetrates still deeper; its upper end coincides with a 'bone dry front,' the progress of which down the pack is controlled by diffusion of vapor to the surface. Results of the analysis are compared to measurements of front position during the drying of unconsolidated fluorite packs. (Knapp-USGS)
W69-04602

SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL-WATER CONTENT DISTRIBUTIONS,
California Univ., Davis. Dept. of Water Science and Engineering.
D. K. Cassel, A. W. Warrick, D. R. Nielsen, and J. W. Biggar.
Work partially supported by US Army Electronics Res and Develop Activity, Ft. Huachuca, Ariz and WRRC, Univ of Calif. Soil Sci Soc Amer Proc, Vol 32, No 6, pp 774-777, Nov-Dec 1968. 4 p, 7 fig, 3 tab, 7 ref.

Descriptors: *Soil water movement, *Diffusivity, Infiltration, Unsaturated flow, Moisture tension, Capillary water, Diffusion, Porous media, Soils, Soil moisture, Temperature.
Identifiers: Soil water diffusivity.

A laboratory method based upon time dependent soil-water content distributions is presented for calculating isothermal soil-water diffusivity values for soils at 5 to 15 volume percent water. The redistribution of water within sealed soil columns was monitored by gamma-radiation attenuation at approximately 100 to 1,000 hour intervals over a period exceeding 3 months. Diffusivity values from numerical integration of the diffusion equation were obtained easily and compared favorably with those of previous investigators. (Knapp-USGS)
W69-04603

FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
Michigan State Univ., Lansing. Dept. of Soil Science; and Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
R. J. Kunze, G. Uehara, and K. Graham.
Soil Sci Soc Amer Proc, Vol 32, No 6, pp 760-765, Nov-Dec 1968. 6 p, 8 fig, 1 tab, 12 ref.

Descriptors: *Hydraulic conductivity, Mathematical studies, Laboratory tests, Digital computers, Computer programs, Hysteresis, Soil moisture, Saturation, Pores, Soil water movement.
Identifiers: Moisture characteristic, Matching factor, Millington-Quirk method, Pore size distribution.

The calculation of hydraulic conductivity by a modified Millington-Quirk method with a matching factor gave conductivity values closely approximating experimentally measured values. The technique requires knowledge of the moisture characteristic and the saturated conductivity. A number of factors that affect the calculated values and improve the computational results were investigated. Calculated conductivity values decreased with an increasing number of pressure classes at low moisture contents. For all soils tested the calculated conductivities were less than the experimental values at the terminal point of the moisture characteristic. This discrepancy was partially corrected by a small change in the Millington-Quirk equation, by extending the moisture characteristics to higher suction values, and by reducing the number of pressure classes to approximately 10. A matching factor, the ratio of measured over calculated saturated conductivity, was found necessary for obtaining the best fit of calculated and measured data. Two conductivity functions calculated separately from each moisture characteristic forming a hysteresis loop, converged as the hysteresis loop was translated to higher tensions. All computations were done by computer. (Knapp-USGS)
W69-04604

VARIATIONS OF EVAPORATION IN TIME AND SPACE: PART 1 AND PART 2,
Nottingham Univ. (England). School of Agriculture.
For primary bibliographic entry see Field 02D.
W69-04618

SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
Forest Service (USDA) Columbus, Ohio. Northeastern Forest Experiment Station.
Ronald Z. Whipkey.
Bulletin, Int'l. Assoc. Sci. Hydrology (1965), Xe Anne No 2, pp 74-85.

Descriptors: *Subsurface runoff, *Subsurface flow, *Hydrologic properties, *Hydraulic conductivity, Soils, Permeability, Soil physical properties, Watershed management, Hydraulic properties, Hydraulic gradient, Soil water movement.

Outflow (or quick interflow) from forested soil profiles was studied under varied rainfall intensities and depths, hydraulic gradients, and antecedent wetting conditions. Greatest quantities of outflow occurred from the transition point between sandy loam and silty loam--the fine textured layer acted as a temporary waterflow-impeding zone. Smallest quantities of flow occurred from the lower silt loam and clay loam layers. Erratic flow occurred from the surface horizon--a sandy loam soil. Little to no overland flow was recorded. The studies showed also that in coarse-textured soil, infiltrated water first travels vertically downward, then travels in an essentially lateral pattern after reaching a finer-textured soil horizon. As storm depth increased, lateral flow increased. Hydraulic gradient curves computed from hydraulic head measurements confirmed the patterns of rise and recession found in the measured outflow.
W69-04637

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
Forest Service (USDA) Columbus, Ohio. Northeastern Forest Experiment Station.
Ronald Z. Whipkey.
Proceedings of an International Symposium on Forest Hydrology, Pennsylvania State University, (1966) Pergamon Press, 255-260.

Descriptors: *Subsurface runoff, *Subsurface flow, *Hydraulic conductivity, *Soil physical properties, *Hydrologic properties, *Permeability, Subsurface drainage, Soil moisture, Soils, Watershed management, Hydraulics, Hydraulic properties, Turbulent flow, Porous media.

A summary of concepts regarding turbulent flow through porous media and application of these to quick interflow from sloping forest souls. Results of empirical field studies are presented and discussed, a recommendation is made for further studies of quick interflow from layered, permeable, forest soils.
W69-04638

A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
Forest Service (USDA) Columbus, Ohio. Northeastern Forest Experiment Station.
Robert L. Blevins, Gerald M. Aubertin, and Nicholas Holowaychuk.
Soil Science Society of America Proceedings (1968) Vol 32, No 5.

Descriptors: *Soil investigations, *Soil analysis, *Soil physical properties, *Soil structure, *Soil texture, Soil strength, Soil stability, Soil mechanics, Soil horizons, Soil density, Soil classifications, Soil tests.

A freezing technique employing liquid nitrogen has been developed to freeze soil blocks in place. This technique allows us to take undisturbed soil samples from loose or poorly structured soils having an abundance of roots and/or a high percentage of coarse skeletal materials. The frozen blocks are transported to the laboratory where they can be cut into appropriate sizes or shapes for bulk density, moisture retention, or microslide studies.
W69-04639

WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.; Wyoming Agricultural Experiment Station, Laramie.
Frank Rauzi, C. L. Fly, and E. J. Dyksterhuis.
U. S. Department of Agriculture, Technical Bulletin 1390, pp 1-58, 1968. 58 p, 1 map, 11 photo, 5 tab, 6 chart, 25 ref, 1 append.

Descriptors: *Intakes, *Soil-water-plant relations, *Great Plains, Soil properties, Wettability, Soil environment, Vegetation effects, Ranges, Soil groups.

Water intake studies were conducted with a mobile raindrop applicator on rangeland sites in six States in the Northern and Central Plains. Tests were designed to measure the effect of vegetational differences on the water intake of comparable soil mapping units at range fenceline contrasts. In addition, concentrations of tests were made on certain small experimental rangeland watersheds containing permanent hydrologic installations. Results of 670 tests on nine range-soil-groups located throughout a wide range in precipitation zones and latitudes were evaluated. Statistical analyses of the data included simple and multiple stepwise regressions. Equations were developed for estimating water intake rates for each range-soil-group. (A list of sixteen results obtained from the study is given on pp. 39-41 s part of the authors summary).
W69-04640

2H. Lakes

WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
Federal Water Pollution Control Administration, Chicago, Ill.; and New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 05B.
W69-04223

A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
Yale Univ., New Haven, Conn. Osborn Zoological Lab; and American Museum of Natural History, New York.
G. Evelyn Hutchinson, and Vaughan T. Bowen.
Proc Natl Acad Sci, Vol 33, No 5, pp 148-153, May 1947, 1 fig, 2 tab, 4 ref.

Descriptors: *Cycling nutrients, *Lakes, *Phosphorus compounds, Connecticut, Eutrophication, Phosphates, Phosphorus radioisotopes, Phytoplankton, Pondweeds, Stratification, Zooplankton, Cyanophyta.
Identifiers: *Linsley Pond (Conn), Potamogeton.

Ten millicuries (approximately 715.1 million counts per minute) of radiophosphorus as sodium phosphate was added to surface waters of Linsley Pond, Connecticut, in 24 equal portions on 21 June, 1946. Authors counted radioactivity in four composite samples collected on 28 June from deepest part of lake representing layers as follows: I, 0-3 meters; II, 3-6 meters; III, 6-9 meters; IV, 9-14.8 meters. Thermocline corresponded roughly with II. Determinations of total phosphorus evidenced a net movement of phosphorus into epilimnion. Of radioactivity added, 74.2% was detected in zones as follows: I, 37.2%; II, 26.5%; III, 10.5%; IV, insignificant. Most of 25,8% radiophosphorus undetected in water probably entered vegetation and sediments in contact with I. As determined from counts of radioactivity, littoral plants concentrated phosphorus a thousandfold over that found in water. Data supports hypothesis that phytoplankters utilize such phosphate, derived from mud, as arrives at trophogenic zone, which is later sedimented, even during stratification of lake, as sestonic phosphorus in dead cells and zooplanktonic feces. Paradoxical appearance of large summer blooms of cyanophytes during periods of low phosphorus concentration can be attributed to steady-state utilization of that phosphorus ultimately derived from sediments. (Eichhorn-Wisc)
W69-04520

EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W69-04521

THE THERMAL CLASSIFICATION OF LAKES,
Yale Univ., New Haven, Conn. Osborn Zoological Lab.
G. E. Hutchinson, and H. Loffler.
Proc Natl Acad Sci, Vol 42, pp 84-86, 1956. 1 fig, 8 ref.

Descriptors: *Lakes, *Thermal stratification, Thermal properties, Limnology, Climatic zones, Altitude, Geographical regions, Tropical regions, Polar regions, Antarctic.
Identifiers: *Lake typology, *Regional limnology, Temperate lakes, Tropical lakes, Polar lakes, Holomictic lakes, Polymictic lakes, Oligomictic lakes, Amictic lakes, Cold monomictic lakes, Dimictic lakes, Warm monomictic lakes, Forel's classification, India, Andes, Ceylon, South America, Africa, Lake Nyasa (Africa), Lake Mohasi (Africa), Lake Tana (Africa), Lake Naivasha (Africa), Lake Rudolf (Africa), Lake Albert (Africa), Lake Victoria (Africa).

In 1880, on basis of their stratification patterns, F. A. Forel classified holomictic lakes (those circulating completely at least once during an annual cycle) as polar, temperate, and tropical. Forel's terminology has been criticized as inaccurate and somewhat inadequate, since altitude as well as latitude determine lakes' thermal properties. Hutchinson proposes substitution of following terms: cold monomictic--lakes never over 4 deg C, with winter inverse stratification under ice and summer circulation; dimictic--circulating twice annually at about 4 deg C with inverse winter and direct summer stratification; warm monomictic--always above 4 deg C, with winter circulation and direct summer stratification. Loffler's study of equatorial Andean lakes suggests two additional categories. In humid tropics, oligomictic lakes seldom mix because long-lasting stratification is induced by high stable temperatures at low altitudes; whereas polymictic lakes continuously mix because unvarying low temperatures at high altitudes never permit stratification. Inversely stratified, amictic lakes, reported from Antarctica and extremely high altitudes, are permanently ice covered and never mix. Report includes plot of altitude versus latitude, upon which is delineated a schematic distribution of lake types described. Existence of special climatic regimes probably produces considerable disturbances of the scheme. (Eichhorn-Wis)
W69-04522

ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 02K.
W69-04524

LINDANE ADSORPTION BY LAKE SEDIMENTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05G.
W69-04525

SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT: LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Geology.
For primary bibliographic entry see Field 05C.
W69-04526

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
Geological Survey, Washington, D. C.
Kenneth N. Phillips, and A. S. Van Denburgh.
Geol Surv Water-Supply Pap 1859-E, pp E1-E60, 1968. 60 p, 11 fig, 13 tab, 23 ref.

Descriptors: *Lakes, *Water quality, *Hydrologic budget, Pacific Northwest U. S., Evaporation, Seepage, Water balance, Fresh water, Lake basins, Lake bottom springs, Thermal springs, Water levels, Water level fluctuations.
Identifiers: Crater Lake, Davis Lake, East Lake.

Crater, East, and Davis Lakes are small bodies of fresh water that occupy topographically closed basins in Holocene volcanic terranes. Because the annual water supply exceeds annual evaporation, water must be lost by seepage from each lake. Crater Lake loses about 89 cfs equivalent to about 72% of its average annual supply. East Lake loses about 2.3 cfs, or about 44% of its estimated supply. Davis Lake seepage varies greatly with lake level, but the average loss is about 150 cfs, more than 90% of its total supply. The destination of the seepage loss is not definitely known for any of the lakes. An approximate water budget was computed for stationary level for each lake. Crater Lake contains about 80 ppm of dissolved solids--mostly silica, sodium, and bicarbonate, and lesser amounts of calcium, sulfate, and chloride. Much of the dissolved-solids content of Crater Lake--especially the sulfate and chloride--may be related to fumarole and thermal-spring activity that presumably followed the collapse of Mount Mazama. Although Crater Lake loses an estimated 7,000 tons of its 1.5 million-ton salt content each yr by leakage, the chemical character of the lake did not change appreciably between 1912 and 1964. East Lake contains 200 ppm of dissolved solids, which includes major proportions of calcium, sodium, bicarbonate, and sulfate, but almost no chloride. The lake apparently receives much of its dissolved solids from subsurface thermal springs. Annual solute loss from East Lake by leakage is about 450 tons, or 3% of the lake's 15,000-ton estimated solute content. Davis Lake contains only 48 ppm of dissolved solids much of which is silica and bicarbonate; chloride is almost completely absent. (Knapp-USGS)
W69-04574

IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
Duke Univ., Durham, N. C., Dept. of Zoology.
For primary bibliographic entry see Field 02K.
W69-04590

GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
Geological Survey, Washington, D. C.
W. S. Eisenlohr, Jr., and C. E. Sloan.
Geol Surv Circ 558, 1968. 12 p, 4 fig, 1 photo, 13 ref.

Descriptors: *Potholes, *Lakes, Water holes, Ponds, North Dakota, Ecology, Hydrology, Groundwater movement, Water table, Runoff, Inflow, Lake basins, Limnology.
Identifiers: *Prairie potholes, Coteau du Missouri.

Hydrologic conditions on a part of the Coteau du Missouri without integrated surface drainage systems are described. The surface of the glacial drift in this region is dotted with shallow prairie potholes which hold water for varying lengths of time. Because precipitation directly on a pothole is the basic source of its water supply, and it is only about half the potential evaporation, potholes tend to go dry. Basin inflow from melting snow or rain occurs only seldom, when the soil is frozen or saturated. Net seepage outflow occurs from potholes on the higher parts of the Coteau at very low rates, but it can amount to 20% to 30% of the total water loss from a pothole. Net seepage inflow occurs at the potholes on the lower parts of the Coteau. The water table tends to be a subdued image of the

topography and is generally very near the land surface. The water surfaces of the potholes are part of the water table, and therefore they can be used to prepare a contour map of the water table; wells usually act as piezometers and thus are useless for such a purpose. Generally, potholes with water relatively low in dissolved soilds have net seepage outflow, and those with water containing high concentration of dissolved solids have net seepage inflow. The direction and rate of groundwater movement can therefore be inferred from the quality of water in potholes. The species of emergent aquatic vegetation that grow in potholes are directly related to the permanence and salinity of the water at the particular site of each species. A table lists common species that can be used as indicators of these conditions. (Knapp-USGS)
W69-04597

GEOLOGY OF GLACIAL LAKE AGASSIZ,
McGill Univ., Montreal (Quebec).
John A. Elson.
In LIFE, LAND AND WATER, Winnipeg, Manitoba Univ Press, pp 37-95, 1967. 58 p, 13 fig, 7 tab.

Descriptors: *Paleohydrology, *Lake stages, *Radioactive dating, Deltas, Basins, Beaches, Quaternary period, Paleolimnology, History, Paleoclimatology, Geomorphology, Minnesota, North Dakota, South Dakota, History.
Identifiers: Glacial Lake Agassiz, Water-level duration, Canada, Ontario, Manitoba, Saskatchewan, Glacial-lake phases, Book.

The topographic setting and geologic deposits of Glacial Lake Agassiz were outlined from map studies, air photo interpretation and synthesis of report data. Although Lake Agassiz sediments occur over 200,000 sq mi in North Dakota, Minnesota, South Dakota, Ontario, Manitoba, and Saskatchewan, that much area was not all submerged at any one time. Most phases in the lake history did not exceed 80,000 sq mi at any one time. Deep-water sediments of the lake collected partially closed bedrock basins, each having its own characteristic sediments, but the most complete series of sediments should be in the Red River basin. The lake history includes 4 high-water stages separated by 3 low-water stages. Glacial Lake Agassiz is outlined showing either definite, approximate, or presumed limits and outlets, and sedimentation basins are shown. The topography of the former lake areas is shown by 200-ft contours. The morphology is sketched to show plains, alluvial fans, abundant beach ridges, deltas, spillways, drumlin areas, De Geer moraines, and end moraines. Sketch maps outline the extent of the lake during the Herman, Norcross, Campbell, McAuleyville, Stonewall, Gimli, and Pipun phases. A total of 21 former water planes are shown diagrammatically both as to altitude and as to chronologic order. Four typical lithologic sections are presented. Tabular data for 33 deltas include latitude and longitude, area, and altitudes. Of the radio-carbon dates reported, one gives a minimum age of lake drainage of 7.270 (plus or minus 120) yr, 22 relate directly to Glacial Lake Agassiz, 12 date alluvium younger than the lake, and 8 date peat deposits in or near the lake basin. Lake fetches ranging from 25 to 400 mi are tabulated in relation to wave height, beach height, energy index, wind velocity, generation time in hr, and deep water limit. (Vorhis-USGS)
W69-04617

2I. Water in Plants

EFFECTS OF FERTILIZER ON FOOD CHAIN ORGANISMS AND FISH PRODUCTION IN NORRIS RESERVOIR, TENNESSEE.
Tennessee Valley Authority, Knoxville. Fish and Wildlife Branch.

TVA Report, 1968. 19 p.

Descriptors: *Aquatic environment, Benthic fauna, Zooplankton, Fish fauna, Electrofishing, Water quality.
Identifiers: Norris Reservoir.

The ability of inorganic fertilizer to increase production and survival of fish food organisms and game fish, thereby increasing sporting fish, in localized cove areas of Norris Reservoir, Tennessee, were studied from April to October 1967. Increasing fishing and nutrients in localized areas of a reservoir in one growing season by fertilization does not appear practical. Fertilization increased the numbers of bottom organisms and zooplankton, but there was no significant change in numbers, size, species, composition, or survival of fish. Temperature and oxygen profiles, coupled with the physical characteristics (directional axis of coves in relation to main creek and cove depth and length) suggest that the age of the water may be very significant in increasing production in coves. (Seigworth-TVA)
W69-04202

2J. Erosion and Sedimentation

SEDIMENT TRANSPORT IN ESTUARINE AREAS,
King's Coll., London (England); and Sir John Cass Coll., London (England).
For primary bibliographic entry see Field 02L.
W69-04240

SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 02L.
W69-04241

MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W69-04269

CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
Department of Agriculture, Washington, D. C.
For primary bibliographic entry see Field 04D.
W69-04501

DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
Corps of Engineers, Vicksburg, Miss.
Fred B. Toffaleti.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6350, pp 225-248, Jan 1969. 24 p, 15 fig, 11 ref, append.

Descriptors: *Bed load, *Sedimentation, *Sediment discharge, Rivers, Sands, Streams, Streamflow, Sediment transport, Channel improvement, Hydraulics, Mathematical models, Digital computers, Computer programs.
Identifiers: Sand transport.

A procedure for an analytic determination of sand discharge in streams is presented especially adaptable to computer programming, requiring only a modicum of input or given data from which the sand discharge fraction are both separately and in combination completely described quantitatively and in distribution from bed to water surface. It has been tested by application and comparison with observed data in all types of rivers, small to large, under a full range of flow conditions, and to model flume experiments conducted under widely varying flow conditions with bed sands varying widely in size and size distribution. It is considered that the results by this procedure are sufficiently accurate, to warrant its use in many types of studies involving quantitative sand transport, design of channels, channel regulation works, and the assessment of probable effects of channel modifications. (Knapp-USGS)
W69-04554

RIVER METAMORPHOSIS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W69-04533

2K. Chemical Processes

CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
Geological Survey, Denver, Colo.; and Denver Board of Water Commissioners, Colo.
Paul R. Barnett, Marvin W. Skougstad, and Kenneth J. Miller.
J Amer Water Works Ass, Vol 61, No 2, pp 61-67, Feb 1969. 7 p, 4 fig, 1 map, 5 tab, 8 ref.

Descriptors: *Water chemistry, *Municipal water, Colorado, Aqueous solutions, Geochemistry, Trace elements, Molybdenum, Water analysis, Water quality, Sampling.
Identifiers: Denver (Colo), Dillon Reservoir (Colo).

The dissolved chemical content of Denver's water supply was studied in a 5-month period beginning in the spring of 1966. The raw water is characterized in terms of both major and minor element constituents. The variations in concentrations over the 5-month period are described and changes in mineral character of the water resulting from plant filtration and chemical treatment processes are demonstrated. Monthly samples of raw and treated water were taken at the 5 water treatment plants and at 4 domestic taps. Water from Dillon Reservoir has an unusually high molybdenum content because of extensive molybdenum mining activity in its drainage area. Results of the analyses are tabulated. The major constituents reported are silica, Ca, Mg, Na, K, bicarbonate, sulfate, chloride, fluoride, nitrate, total solids, hardness, and noncarbonate hardness. The minor elements are Al, Ba, N, Cr, Cu, Fe, Li, Mn, Mo, Rb, Sr, Ti, and Zn. (Knapp-USGS)
W69-04245

LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
Akademiya Nauk SSSR, Leningrad.
D. C. Kvasov.
Nature, Vol 221, No 5183, pp 850-851, Mar 1, 1969. 2 p, 1 tab, 18 ref.

Descriptors: *Brines, *Sea water, *Sea level, Pleistocene epoch, *Paleolimnology, Saline lakes, Saline water, Evaporation.
Identifiers: Red Sea, Red Sea hot brine pools.

The suggestion is offered that recently discovered lenses of hot brine at the bottom of the Red Sea may be remnant waters of Pleistocene lakes isolated in the Red Sea basin by lowering of sea level below the basin threshold elevation. The threshold is no more than 126 m deep, much less than Pleistocene sea level lowering, and evaporation of sea water can produce brines of the chemical and isotopic composition found in the Red Sea brine pools. Lowering of the brine-Red Sea water interface by diffusion would be only on the order of about 100 m in 14,000 years. Heat from the bottom in the Red Sea Rift Zone may be responsible for the brine temperature of up to 56.5 deg C. The possibility that the brines are remnants of Pleistocene lake waters is of great importance for further limnological work. (Knapp-USGS)
W69-04254

CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 02F.
W69-04261

VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
Colorado Univ., Boulder. Dept. of Civil Engineering; and Stanford Univ., Calif., Dept. of Civil Engineering.
K. Daniel Linstedt, and Paul Kruger.
J Amer Water Works Ass, Vol 61, No 2, pp 85-88, Feb 1969. 4 p, 2 fig, 3 tab, 4 ref.

Descriptors: *Water quality, *Trace elements, *Colorado River Basin, Colorado River, Mining, Water pollution sources, Path of pollutants, Water chemistry, Geochemistry.
Identifiers: *Vanadium, Uranium mills.

A radiochemical activation analysis procedure was devised to measure traces of vanadium, which is sometimes associated with uranium milling, in waters of the Colorado River Basin. Samples were collected at Flaming George Dam, Animas River near Cedar Hill, N. M., San Juan River near Shiprock, N. M., and 5 Colorado River sites at Loma, Colo., Glen Canyon Dam, Hoover Dam, Parker Dam, and Davis Dam. Vanadium is concentrated by a cation resin and irradiated in the Stanford University 10-Kw research reactor. Activity of the samples is compared with that of activation standards to calculate vanadium concentration of the water sample. The sensitivity of the analysis is about 1 microgram. A flow sheet of the analysis procedures is shown. Results of 160 sample analyses are tabulated. The results suggest that natural leaching of ore does not represent a major vanadium in river water. Vanadium concentration is related to uranium mill sites, and varied between 0.2 micrograms/liter upstream from any milling activity to 49.2 micrograms/liter in the vicinity of uranium-vanadium milling activities. (Knapp-USGS)
W69-04264

SILICA IN ALKALINE BRINES,
Geological Survey, Washington, D. C.; and Johns Hopkins Univ., Baltimore, Md., Dept. of Geology.
Blair F. Jones, Shirley L. Rettig, and Hans P. Eugster.
Science, Vol 158, No 3806, pp 1310-1314, Dec 8, 1967. 5 p, 3 fig, 1 tab, 18 ref.

Descriptors: *Brines, *Alkaline water, *Silica, Water analysis, Hydrogen ion concentration, Carbonates, Drainage water, Oregon, Saline water, Sulfates, Sodium, Spring waters, Boron, Fluorides, Geochemistry, Chlorides, Faults (Geology), Halides, Volcanoes.
Identifiers: Great Basin province, U.S.A., Lake Magadi, Kenya (Africa), Deep Springs Valley (Calif), Abert Lake (Oreg).

Sodium carbonate-bicarbonate brines from closed basins located in the volcanic regions of Oregon and Kenya were analyzed and described. The study shows several silica contents of up to 2,700 ppm at pH's higher than 10. This high concentration of silica can be attributed to the reaction of waters with silicates and subsequent concentration by partial evaporation. Supersaturation with respect to amorphous silica may occur for brines out of contact with silicate muds. Addition of more dilute waters to alkaline brines may lead to the lowering of pH and thus cause inorganic precipitation of silica. A drop in pH from 11.0 to 8.5 can cause precipitation of as much as 3,000 ppm silica, which corresponds to a 1.5-mm-thick layer of chert for each meter of depth of brine. (Gabriel-USGS)
W69-04270

EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
I. G. Kissin, and S. I. Pakhomov.
Translated from Geokhimiya, No 3, pp 341-355, 1967. Geochem Int, Vol 4, No 2, pp 295-308, 1967. 14 p, 3 fig, 6 tab, 11 ref.

Descriptors: *Water chemistry, *Groundwater, *Leaching, *Thermal water, *Ion exchange, Adsorption, Aqueous solutions, Chemical reactions, Saline water systems, Salts, Water temperature, Water quality.
Identifiers: USSR, Deep artesian basins.

The interactions of claystone and siltstone with water of various compositions at temperatures from 20 to 200 deg C were studied experimentally to investigate the water-rock chemical relationships in deep artesian basins. The composition of solutions produced by leaching changes substantially with temperature and depends on rock composition. Highly concentrated original solutions, particularly those low in calcium, extracted calcium from the rock in exchange for sodium, forming calcium-sodium chloride waters. Increase in temperature usually favors higher salinity of leaching waters but it also causes desorption of water from clays, and may decrease total water salinity in some cases. (Knapp-USGS)
W69-04271

GEOCHEMISTRY OF EPIGENESIS,
Akademiya Nauk SSSR. Institut Geologii Rudnykh Mestorozhdenii, Petrografii, Mineralogii i Geokhimii.
Aleksandr I. Perel'man.
Trans by N. N. Kohanowski, Univ. of North Dakota. Monographs in Geoscience. New York, Plenum Press, 1967. 266 p, 57 fig, 34 tab, 151 ref.

Descriptors: *Geochemistry, *Soil chemistry, *Water chemistry, *Weathering, Geomorphology, Soil formation, Provenance, Aqueous solutions, Chemical reactions, Biochemistry, Ion transport.
Identifiers: Epigene processes, Epigenesis, Geochemical prospecting, Ore formation, Ore migration, Soil biochemistry, Hydrogeochemistry.

The hydrogeochemistry of the epigene, or weathering, portion of the Earth is discussed in a textbook written for the needs of geologists using geochemical means of exploration for ores and for geomorphologists interested in biochemical processes of sediment formation. The geochemical approach to the study of epigenetic processes is necessary in problems such as geochemical prospecting and theories of exogenous ore formation, as well as the study of weathering. The importance of biological processes in mineral formation, transportation, and transformation in the upper crust is stressed. A relatively small number of epigenetic processes characterize the supergene zone, and may develop in different media - soils, alluvium, aquifers, etc. Processes of migration of elements are therefore similar in the different media, as for instance salt migration in soils and aquifers. Chemical processes and media form the basis of a scheme of classification of elements, environments, chemical reactions, and modes of transport in epigenetic processes. (Knapp-USGS)
W69-04274

EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W69-04521

ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
Charles C. Davis.
Arch Hydrobiol, Vol 59, No 2, pp 145-161, April 1963. 57 ref.

Descriptors: *Ecosystems, *Productivity, Biomass, Circulation, Ecology, Energy conversion, Eutrophication, Food webs, Harvesting, Oligotrophy, Standing crop, Trophic level.
Identifiers: *Production, Energoproductivity, Energoproduction, Organoproductivity, Organoproduction, Mesotrophy, Biogenic production, Biogenic capacity, Concepts, Chemotrophs, Terminology, Holophytes.

This paper represents an attempt to bring order to confusions and ambiguities in terms relating to trophic ecology which had arisen prior to its publication. Author distinguishes between production, the actual rate of formation of organisms under existing conditions, and productivity, the potential rate of formation of organisms under 'ideal' conditions. Such rates can be considered in terms of stored potential chemical energy (energoproduction, energoproductivity) and its subsequent dissipation or in terms of formed organic matter (organoproduction, organoproductivity) and its subsequent remineralization. Clear delineation of these four concepts leads to hierarchical scheme defining following functions of the four basic rates: gross and net primary, gross and net total, gross and net at secondary or higher trophic levels, and gross and net rates for particular groups of organisms (fish, phytoplankton, etc). Harvest and yield are defined as removal of organisms, former being more highly organized (eg, human fishing) compared with latter (eg, grazing). Author discusses examples from the literature of loose application of terms for well defined concepts including standing stock, biomass, and organomass. Davis feels that concept of productivity, as related to trophic status of lakes, loses all ecological meaning if removed from its dependence on local conditions. (Eichhorn-Wis)
W69-04524

SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT: LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Geology.
For primary bibliographic entry see Field 05C.
W69-04526

GEOCHEMISTRY OF NATURAL WATERS,
Moscow State Univ. (USSR). Dept. of Geochemistry.
M. G. Valyashko.
Trans from Geokhimiya, No 11, pp 1395-1407, 1967. American Geological Inst Document No GI 67-11-13, 1968.

Descriptors: *Geochemistry, *Water chemistry, *Classification, Carbonates, Sulfates, Chlorides, Evaporation, Sea water, Solutes, Paleohydrology, Meteorites, Extraterrestrial hydrology.
Identifiers: Origin of water.

The composition of natural waters is related to the solubilities of the principal compounds formed by the major ions in solution. Based primarily on the relative proportions of calcium vs. carbonate species plus sulfate, the basic chemical types of water are classified as carbonate (soda), sulfate, and chloride (calcium chloride); acid waters are considered a special separate type. Natural waters are the result of degassing of the mantle. Comparison of volatiles relative to water in chondrites with the composition of sea water indicates little difference for chlorine and bromine, small decreases in iodine and boron, and large decreases for fluorine and carbon. The great variety of continental waters are derived by variable mixtures of evaporated and precipitated solutions of sea water origin. (Knapp-USGS)
W69-04562

MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
Yale Univ., New Haven, Conn. Dept. of Geology.
Robert A. Berner.
Research supported by ACS Petroleum Res Fund and National Science Foundation. Amer J Sci, Vol 267, No 1, pp 19-42, Jan 1969. 24 p, 5 fig, 1 plate, 13 ref. Grant 1937-A2,ACS, Grant GA-1441 NSF.

Descriptors: *Iron, *Sulfides, *Anaerobic conditions, *Migration, *Bottom sediments, *Diagenesis, *Ion transport, Mud, Organic matter, Oxidation-reduction potential, Hydrogen sulfide, Model studies, Anaerobic bacteria, Sulfates.
Identifiers: Diagenetic models, Iron sulfides.

Three diagenetic models based on layered situations are presented to illustrate important factors affecting the migration of iron and sulfur within recently deposited anaerobic sediments. The 2 most important factors considered are sharp variation with depth of organic matter content, which is assumed to be the same in each model, and the original concentration of reactive ferruginous material which is varied between models. In a low reactive iron sediment, bacterial generation of hydrogen sulfide in an organic-rich layer should lead to darkening and iron sulfide formation in adjoining organic-poor sediment to a distance far greater than the thickness of the organic layer. Equations derived enable calculation of this distance and the rate of darkening from a small number of parameters characteristic of the sediment. In a high reactive iron sediment an organic-rich layer should be enriched at its boundaries in iron sulfide by the diffusion of dissoved iron and sulfate toward the organic layer. In sediments of reactive iron content transitional between the high and low types, iron sulfide liese-gang banding may form. Juxtoposed artificial sediments of greatly differing organic matter content undergo qualitative changes predicted by the 3 models. The experiments also demonstrate quantitatively the general validity of the low iron content model. The same reasoning applied to the layer models can be recast in a 3-dimensional context to describe changes in organic-poor sediment surrounding an organic-rich body, an example of the often cited reducing micro-environment. In 1-dimensional (layer) or 3-dimensional form the high iron model may be the correct mechanism for the formation of many pyrite layers, concretions, and pyritized fossils. (Knapp-USGS)
W69-04572

ALUMINUM IONS IN AQUEOUS SOLUTIONS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology; and Missouri Univ., Columbia. Dept. of Agricultural Chemistry.
A. L. Reesman, E. E. Pickett, and W. D. Keller.
Amer J Sci, Vol 267, No 1, pp 99-113, Jan 1969. 15 p, 1 fig, 3 tab, 15 ref.

Descriptors: *Aluminum, *Ions, *Solubility, *Aqueous solutions, *Free energy, Chemical reactions, Chemical potential, Ionization, Hydrogen ion concentration, Chemical properties, Acidity, Hydrolysis, Water chemistry.
Identifiers: Aluminum ion polymers.

The free energy of formation of A1 (OH) sub 4 ion and A1 (OH) sub 2 ion were estimated as -311.3 and -216.1 kcal/mole, respectively, from aqueous solubility data of high-alumina and aluminum silicate clay minerals. The log solubility constants for boehmite are 14.4 and 15.0 respectively, yielding an isoelectric point at pH of 6.70. Electrophoretic migration of aluminum ions at various values of pH indicate that the relative effective charge on the anionic forms of aluminumions between pH 10.0 and 12.5 are approximately equal and opposite to the cationic forms between pH 4.07 and 2.85. A marked 3-fold increase in distance of migration occurred between pH 2.85 and 1.0, indicating that a probable 3-fold increase in effective charge, A1 (OH) sub 2 ion to A1 ion had occurred within this range in pH. (Knapp-USGS)
W69-04575

NITRIFICATION: IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
Dartmouth Coll., Hanover, N. H. Dept. of Biological Sciences; Dartmouth Coll., Hanover, N. H., Dept. of Earth Sciences; and Yale Univ., New Haven, Conn. School of Forestry.
Gene E. Likens, F. H. Bormann, and Noye M. Johnson.
Science, Vol 163, No 3872, pp 1205-1206, Mar 1969. 2 p, 2 tab, 13 ref.

Descriptors: *Leaching, *Runoff, *Clear-cutting, *Nitrification, Demonstration watersheds, Rainfall, Sulfates, Nitrates, Magnesium, Calcium, Sodium, Potassium, Oxidation, Ecosystems.
Identifiers: Deforestation, Experimental watersheds.

Nitrate concentration in runoff from a plot in the Hubbard Brook Experimental Watershed was 0.9 mg/1 before deforestation and increased to 53 mg/1, 2 yr later. The nitrate mobilization was probably increased by increased microbial nitrification caused by removal of vegetation, and oxidation of forest litter. Calcium concentrations increased from 1.8 to 7.6 Mg from 0.4 to 1.5, Na from 0.9 to 1.5, and K from 0.2 to 3.0 in the same 2-yr period. Sulfate decreased by about 45%. (Knapp-USGS)
W69-04584

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
Geological Survey, Austin, Tex.
Donald K. Leifeste.
Tex Water Develop Board Rep No 87, Dec 1968. 32 p, 13 fig, 6 tab, 29 ref.

Descriptors: *Water quality, *Surface waters, *Texas, Streamflow, Runoff, Saline water, Duration curves, Reservoirs.
Identifiers: Sulphur River basin (Tex), Cypress Creek basin (Tex), Concentration-flow-duration curves.

The Sulphur River and Cypress Creek basins are free of serious water-quality problems. Continued municipal and industrial growth will increase the waste-disposal burdens of the streams, and planned impoundments will cause a reduction in the streamflow which now aids in waste assimilation. As the water resources of the basins are developed, the magnitude and significance of the probable changes in water quality will necessitate studies of the resulting problems. The Sulphur River and Cypress Creek basins are adjacent basins in the northeast corner of Texas. Their combined drainage area in Texas is 6.370 sq mi. Both basins are completely within the West Gulf Coastal Plain section of the Coastal Plain physiographic province. The climate of the study basins ranges from moist subhumid to humid. The average annual precipitation ranges from 42 in. in the west to 48 in. in the east and averages about 45 in. About one-fourth of the precipitation appears in the streams as runoff. Surface water in the Sulphur River and Cypress Creek basins is generally of good chemical quality and is suitable for most municipal, industrial and agricultural purposes. The kinds and quantities of minerals dissolved in surface waters of the basins are related principally to the geology of the runoff area and to rainfall and streamflow characteristics, but are also affected by industrial activities. The water in streams is usually low in concentration of dissolved materials. Water from the Cretaceous and Tertiary rocks in the Sulphur River basin is generally of a mixed type containing less than 250 ppm dissolved solids, except in the White Oak Creek subbasin where oil-field drainage intermittently degrades the quality of the water. In the Cypress Creek basin, the Cretaceous rocks contribute a sodium chloride type water that generally contains less than 250 ppm dissolved solids. The chloride content of the surface waters is generally less than 25 ppm, except where oil-field drainage is affecting the quality of the water. All the reservoirs in the basins contain water of very good quality. The dissolved-solids concentration is usually less than 150 ppm. Water available for storage at potential reservoirs is also of very good quality. (Knapp-USGS)
W69-04586

IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
Duke Univ., Durham, N. C., Dept. of Zoology.
Roger W. Doyle.
Amer J Sci, Vol 266, No 10, pp 980-994, Dec 1968. 15 p, 6 fig, 1 tab, 26 ref.

Descriptors: *Sulfides, *Iron, *Solubility, *Chemical properties, Eutrophication, Bottom sediments, Ion transport, Diffusion, Oxidation, Oxidation-reduction potential, Hydrogen sulfide, Hydrogen ion concentration, Mineralogy.
Identifiers: Griegerite, Mackinawite.

The dispersed and poorly crystalline iron sulfide that darkens the color of anaerobic sediment containing high concentrations of dissolved ferrous iron has been tentatively identified as mackinawite (tetragonal FeS) in sediment from Linsley Pond, Connecticut. The mineral was identified by suspending sediment in solutions saturated with hydrogen sulfide at one atm pressure and determining the equilibrium ion activity product (equilibrium IAP) of the reaction: FeS= Fe ion + S ion. The IAP was 10 exp -17.7 compared to published values of 10 exp -17.6 for synthetic mackinawite. These values can be assumed to approximate the 'solubility product' of FeS in environments such as the hypolimnia of Linsley Pond and Lake Mendota. Calculations based on the activity of Fe, pH, and Eh in Linsley Pond indicate that mackinawite is stable relative to greigite, in agreement with observation. Since greigite has been shown to be stable relative to mackinawite in marine sediment, this mineral may be useful in differentiating Fe-rich and hydrogen sulfide-rich environments in the fossil record. (Knapp-USGS)
W69-04590

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W69-04593

SALINE GROUND WATER IN LOUISIANA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W69-04608

ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
Moscow State Univ., (USSR). Dept. of Geochemistry.
N. A. Titayeva.
Trans from Geokhimiya, No 12, pp 1493-1499, 1967. Geochem Int, Vol 4, No 6, pp 1168-1174, 1967. 7 p, 4 fig, 5 tab, 22 ref.

Descriptors: *Radium radioisotopes, *Uranium radioisotopes, *Peat, *Geochemistry, Leaching, Adsorption, Reduction (Chemical), Oxidation, Bicarbonates, Clays, Sorption, Ion exchange, Soils, Humic acids.

Uranium is considerably more mobile than radium in surface waters containing small amounts of calcium bicarbonate. Radium is readily sorbed by clays as well as by peat. In peat, uranium is bound to the humic and fulvic acids soluble in alkali, whereas the radium is associated with the insoluble residue. Under oxidizing conditions, the elements appear to be retained by ion exchange, but in the presence of high concentrations of calcium in the water, the radium in the peat and in the insoluble residue becomes nearly unexchangeable. The exchangeability of that radium bound to the humic acid is, however, retained. (Knapp-USGS)
W69-04612

A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
Gornyi Institut, Leningrad (USSR).
A. N. Pavlov, and V. N. Shemyakin.
Geochem Int, Vol 4, No 6, pp 1159-1164, 1967. 2 fig, 1 tab, 10 ref. Trans from Geokhimiya, No 12, pp 1482-1488, 1967.

Descriptors: *Water chemistry, *Chemical properties, *Oxidation-reduction potential, *Hydrogen ion concentration, Geochemistry, Hydrogen sulfide, Oxygen, Classification.

Identifiers: Hydrogeochemistry.

On the basis of limiting values of Eh, pH, concentrations of oxygen and hydrogen sulfide, plus dissociation reactions for the principal acid and alkaline species, natural waters are separated into classes. A definite classification scheme is suggested to relate each class to real Eh and pH values. Superscripts and subscripts are then utilized to indicate oxygen and hydrogen sulfide contents of waters of each class. A graphical method for assigning waters to their classes by Eh and pH is given. (Knapp-USGS)
W69-04626

THE AERATION CAPACITY OF STREAMS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04628

2L. Estuaries

LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
British Columbis Univ., Vancouver. Dept. of Mathematics; British Columbia Univ., Vancouver. Inst. of Oceanography; and Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 02A.
W69-04224

SEDIMENT TRANSPORT IN ESTUARINE AREAS,
King's Coll., London (England); and Sir John Cass Coll., London (England).
J. E. Prentice, I. R. Beg, C. Colleypriest, R. Kirby, and P. J. C. Sutcliffe.
Nature, Vol 218, No 5148, pp 1207-1210, June 29, 1968. 4 p, 5 fig, 8 ref.

Descriptors: *Estuaries, *Sediment transport, *Sedimentation, Currents (Water), Tides, Sand waves, Sediment distribution, Water circulation.
Identifiers: England, Thames estuary, Medway estuary, Taw-Torridge estuary.

Study of sedimentation in the Thames, Medway, and Taw-Torridge estuaries of England shows varied and complex sedimentary processes of chiefly marine influence. The principal agents of transport are tidal currents; river flow reinforces the ebb-current and provides some suspended sediment. Inner reaches of estuaries receive suspended sediment from the sea and some from bank erosion. The majority of the sediment is carried in suspension near the bed but is a dense fluid, not a true bed load. The net movement of the true bed load is upstream from sources outside the estuaries, as shown by distribution of the remains of ostracods and by the symmetry of sand waves. All estuarine areas show preferred ebb and flood paths. The strongest flood path meanders, but the strongest ebb is straighter. (Knapp-USGS)
W69-04240

SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
California Univ., Santa Barbara.
Robert M. Norris.
Mineral Information Serv, Vol 21, No 6, pp 87-91, June 1968. 5 p, 1 map, 7 photo, 2 ref.

Descriptors: *Bank erosion, *Waves (Water), *Ocean waves, Tides, Surf, Beach erosion, California.
Identifiers: Santa Barbara (Cal), Cliff erosion, Erosion rate, Cliff recession.

A series of studies along the 10 mi of coast west of Santa Barbara, California, shows that erosion at appreciable rates occurs at most points. The coastline is a rocky cliff 40-200 ft high with a narrow sandy beach at the base. The rocks of the cliff are of Miocene to Recent age, mostly quite soft. Maximum tidal range is 9.0 ft and the average spring tide range is 5.6 ft. Most of the waves are less than 3 ft high and only occasionally exceed 4-5 ft. Cliff recession was determined by comparing present distances from USCGS triangulation station monuments with the distances measured at their installation dates, and varied from 0 to 10 inches per yr. (Knapp-USGS)
W69-04241

PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
Maryland Univ., Solomons. Natural Resources Inst.; and Maryland Dept. of Natural Resources.
Joseph A. Mihursky.
Maryland Univ Nat Resources Inst Spec Rep No 1, Jan 1969. 20 p, 1 fig, 1 map, 1 tab, 82 ref. Research done under contract between Maryland Univ (NRI) and Maryland Dep Water Resources.

Descriptors: *Thermal pollution, *Estuaries, *Thermal powerplants, Heated water, Path of pollutants, Pollution abatement, Legal aspects, Social aspects, Biological communities, Ecosystems, Regulation, Control, Inspection, Operations, Standards, Water policy.
Identifiers: Patuxent estuary (Md), FWPCA.

Studies in 1962-1967 of the effects of heated water discharges into the Patuxent estuary, Maryland, are summarized and recommendations for control, regulation, powerplant operating procedures, and future studies are listed. The objectives of the program were to understand the physical, chemical, and biological effects of heated water releases, to determine quantitatively the effects of installing a major power unit at Chalk Point, and to study the factors which control populations of estuaries. The topics studied in detail are the biological role of temperature and temperature change, uses and potential uses of the estuary, history of Patuxent thermal studies, results of field studies, results of laboratory studies, predictions based on laboratory studies, evaluation of Maryland's temperature regulations, constructive uses of waste heat, site selection and alternative methods of water use, and recommendations. (Knapp-USGS)
W69-04244

ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
Tampa-Hillsborough Bay Technical Assistance Project, Tampa, Fla.; and Federal Water Pollution Control Administration, Washington, D. C., Office of Estuarine Studies.
For primary bibliographic entry see Field 05C.
W69-04248

NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05C.
W69-04276

ESTUARIES,
American Association for the Advancement of Science, Washington, D. C.
George H. Lauff.
Washington: Publication No. 83, 1967.

Descriptors: *Water pollution, *Water properties, *Estuarine fisheries, *Foreign waters, *Nekton, *Bibliographies, Sedimentation, Nutrients, Geomorphology, Ecology, Fisheries, United States, Geographical regions, Regions, Indian Ocean, Bodies of water, Oceans, Surface waters, Coasts, Salinity, Chemical properties, Water types, Animals, Aquatic animals, Aquatic life, Seston.

This is a collection of 71 papers presented at an estuarine conference. Most of the articles deal with physical and biological, rather than economic, aspects of estuaries. Two articles deal with the problem of defining estuaries. Sundry articles relate to salinity, circulation, sedimentation, geomorphology, microbiota, nutrients, ecology, and physiology. Several articles deal with estuarine fisheries, including those of the Gulf Coast of the United States, West Africa, Indian Ocean Coastal Zone, and Europe. The article by J. L. McMugh, entitled 'Estuarine Nekton', provides excellent perspective on the general topic. Four articles relate to estuarine pollution, including 'The Role of Man in Estuarine Processes' by L. Eugene Cronin, which provides good general perspective on past and present human influences on physical and biological processes in estuaries. The book contains an extensive supplemental bibliography with references through 1966.
W69-04278

PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
Bureau of Sport Fisheries and Wildlife, Vero Beach, Fla.
For primary bibliographic entry see Field 04A.
W69-04288

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
Stanford Univ., Calif.
C. A. McCullough, and J. D. Vayder.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 676-709.

Descriptors: *Mathematical models, *Dye releases, *Water quality control, *California, *Tracers, Geographical regions, Pacific coast regions, Regions, Southwest U. S., Bays, Bodies of water, Tracking techniques, Path of pollutants, Mathematical studies, Model studies, Deltas, Water pollution, Waste disposal, Water pollution control, Control.

Water quality tests were made to assess the present water quality of the Delta-Suisun Bay (San Francisco, California). A mathematical model was superimposed on the hydraulic model to predict conditions resulting from changes in the location and quantities of water released into the Delta. Fluorescent dye tracers were used to determine the impact of waste discharges at sensitive locations in the bay. It was concluded that saline intrusion and other water quality control problems could be controlled by releases of fresh water from storage areas located in points around the Delta.
W69-04291

ESTUARINE NEKTON,
American Association for the Advancement of Science, Washington, D. C.
J. L. McHugh.
In ESTUARIES, 1967, pp 581-620.

Descriptors: *Estuarine fisheries, *Nekton, *Market value, *Fish harvest, Estuarine environment, Aquatic habitats, Bays, Animals, Aquatic animals, Aquatic life, Seston, Aquatic environment, Environment, Fisheries, Value, Habitats, Ecology, Competition, Productivity.

The general physical characteristics, as well as the biological parameters and distribution, of nektonic organisms in estuaries are described. A discussion of estuarine fisheries is provided, giving figures on commercial landings and dollar values. The role of man as a predator in estuaries is discussed.
W69-04292

MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
Claire L. Schelake, and Eugene P. Odum.
In CLEAN WATER FOR THE NATION'S ESTUARIES., Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, November 29, 1968, pp 75-80.

Descriptors: *Georgia, *Productivity, Nutrients, Tides, Photosynthesis, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., Aquatic life, Tidal effects, Data collections.

The results of studies of the extensive, unpolluted estuaries at Sapelo Island, Georgia, indicate that the following factors are responsible for high productivity: (1) ebb and flow water movements resulting from tidal action, (2) abundant supplies of nutrients, (3) rapid regeneration and conservation of nutrients due to activity of microorganisms and filter feeders, (4) three types of primary production units (harsh grass, benthic algae, and phytoplankton), which insure maximum utilization of light at all seasons, and (5) year-round production with successive crops. These factors are discussed and illustrated by data obtained by various workers at the University of Georgia Marine Institute, Sapelo Island.
W69-04334

THE MIXING PROCESSES IN A TIDAL ESTUARY,
K. F. Bowden.
International Journal of Air and Water Pollution, Vol 7, No 4/5, June, 1963, pp 343-356.

Descriptors: *Mixing, *Mathematical studies, *Tidal waters, Diffusion, Density currents, Currents (Water), Saline water-freshwater interfaces, Boundaries (Surfaces), Interfaces, Stability, Viscosity, Physical properties, Diffusivity, Hydrologic properties.

The author briefly reviews the literature concerned with mixing processes in a tidal estuary. A modified approach is presented to account for the significant effects of density currents upon longitudinal diffusion and the importance of stability effects on reducing vertical eddy viscosity and diffusivity.
W69-04444

AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
For primary bibliographic entry see Field 05C.
W69-04454

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, to december, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
For primary bibliographic entry see Field 05B.
W69-04462

DELAWARE RIVER MODEL STUDY REPORT NO. 2 - SALINITY TESTS OF EXISTING CHANNEL.
Waterways Experiment Station, U. S. Army Corps of Engineers, Technical Memo No. 2-337, June, 1954.

Descriptors: *Saline water intrusion, *Delaware River, *Model studies, Reservoir construction, Construction, Reservoir operation, Discharge (Water), Fresh water, Water types, Bodies of water, Interstate rivers, Rivers, Running waters, Streams, Surface waters, Management, Operations.

Salinity intrusion in the Delaware Estuary is reported for existing (1942) channel conditions. The purposes of these studies were to determine: (1) the effects of each principal factor known or believed to affect the nature and extent of salinity intrusion in the estuary, with a view toward arriving at a proper explanation for the increase in extent of salinity intrusion that has occurred in the prototype since about 1930; and (2) the effects of the proposed Incodel Plan, involving reservoir construction and operation to regulate the fresh-water discharge of the Delaware River above Trenton, on salinities throughout the estuary and especially in the critical reach between Philadelphia and the Delaware-Pennsylvania state line. Descriptions of the prototype and the model and appurtenances, and a brief discussion of the hydraulic and salinity adjustment and verification are included in this report for the convenience of the reader. A sufficient number of representative plates showing the agreement attained between model and prototype hydraulic and salinity phenomena are included herein to demonstrate that the model is capable of accurately reproducing all pertinent phenomena of the prototype.
W69-04466

FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
For primary bibliographic entry see Field 06B.
W69-04472

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
For primary bibliographic entry see Field 06G.
W69-04477

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
John B. Lockett.
In PROCEEDINGS OF THE INTER-AGENCY SEDIMENTATION CONFERENCE, 1963, Miscellaneous Publication No 970, June, 1965, pp 626-668. Department of Agriculture, Washington, D. C.

Descriptors: *Channel improvement, *Oregon, *Columbia River, *Jetties, Dredging, Bodies of water, Interstate rivers, Rivers, Running waters, Streams, Surface waters, Sediment distribution, Sediment control, Dikes, Earthworks, Embankments, Engineering structures, Hydraulic structures, Structures, Coastal structures, Sediment transport, Sedimentation.

This article gives an historical account of efforts to maintain a channel through the Columbia River entrance. Jetties were used with some success to confine entrance flows to alter sediment disposition. These jetties have been rebuilt and some dredging has been required. Disposal was off-shore. The article reviews more recent scientific analysis which has been conducted on sediment movement and estuarine hydraulics.
W69-04478

MANAGEMENT OF ESTUARINE FISHERIES,
American Fisheries Society, Atlantic City, New Jersey.
For primary bibliographic entry see Field 06B.
W69-04481

NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
Cornelius R. Mock.
Gulf and Caribbean Fisheries Institute, Proceedings, Vol 19, 1966, pp 86-98.

Descriptors: *Shrimp, *Habitats, *Bulkheads, *Environmental effects, *Aquatic productivity, Land reclamation, Animals, Aquatic animals, Aquatic life, Commercial shellfish, Crustaceans, Invertebrates, Shellfish, Environment, Aquatic habitats, Engineering structures, Structures, Hydraulic structures, Walls, Ecology, Productivity.

This study demonstrates what can happen to a shrimp nursery area when it is altered by bulkheading. Two areas were chosen--one adjacent to an unaltered vegetative shore and the other near a concrete bulkhead. Both had similar hydrology and sediment types, but differed in the amount of organic detritus in the bottom sediments and in water depth. Intensive sampling over a ten-month period produced 2.5 times more brown shrimp (Penaeus Aztecus) and fourteen times more white shrimp (P. Setiferus) from the natural habitat than the bulkheaded area. The preference for the unaltered habitat depended on the physical rather than the hydrologic characteristics of the habitat.
W69-04484

A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
D. W. Pritchard.
Paper presented to the Eleventh Meeting, Susquehanna River Basin Coordinating Committee, Elmira, New York, 1965.

Descriptors: *Salinity, *Bays, *Model study, *River flow, *Diversion, Maryland, Virginia, Chemical properties, Water properties, Bodies of water, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Southeast U. S., Channel flow, Flow, Streamflow, Management, Routing, Water management (Applied).

The effects of flow from the Susquehanna River into the Chesapeake Bay upon the salinity of the Bay are reported. The relationship depends not only upon the river discharge in the recent past but also in a complex way upon the flow history. The author recommends construction of an adequately scaled hydraulic model to investigate the variables involved.
W69-04493

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
For primary bibliographic entry see Field 06F.
W69-04512

CURRENTS IN AN INTEROCEANIC CANAL,
Corps of Engineers, Jacksonville, Fla. Interoceanic Canal Studies Branch.
For primary bibliographic entry see Field 02E.
W69-04557

SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
Donald R. F. Harleman, and Arthur T. Ippen.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6340, pp 9-27, Jan 1969. 19 p, 15 fig, 3 tab, 13 ref, append.

Descriptors: *Estuaries, *Currents (Water), *Encroachment, *Saline water intrusion, Tides, Shoals, Sedimentation, Froude number, Tidal effects, Discharge (Water), Streamflow.
Identifiers: Savannah River, Delaware River, Tidal currents.

In the salinity intrusion region of an estuary the internal velocity distribution in the longitudinal direction is modified by the density effects. If the velocities are averaged over a tidal cycle the result is an increase in the surface velocities in the downstream (ebb) direction and a reversal of the near-bottom velocities so that the net velocity is in the upstream (flood) direction. The region of heavy shoaling in an estuary is shown to be related to the location of the null point at which the near-bottom velocity reverses from a net landward to a net seaward direction. The location of the null point is shown to be related to the longitudinal salinity distribution through a correlation based on the local densimetric Froude number. A method is developed for predicting the longitudinal change in the region of heavy shoaling due to changes in channel depth or fresh water discharge. The method is developed from laboratory data obtained at M.I.T. and W.E.S. (Vicksburg) and is applied to the Savannah and Delaware estuaries. (Knapp-USGS)
W69-04558

DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
Donald W. Pritchard.
Work supported by Office of Naval Res and U. S. Atomic Energy Comm. ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6344, pp 115-124, Jan 1969. 10 p, 2 fig, 3 ref, append. No. 4010 (11)NR AT (30-1)-3109, Doc. No. NYO-3109-33.

Descriptors: *Path of pollutants, *Estuaries, *Currents (Water), Mathematical models, Water pollution, Density currents, Tides, Tidal effects, Diffusion, Dispersion, Saline water, Streamflow, Tidal waters, Maryland.
Identifiers: Tidal currents, Chesapeake Bay.

The fate of a pollutant introduced into an estuary depends upon the relative density of the effluent and the receiving water, the vertical density structure of the estuary, the strength of the tidal currents, the nontidal circulation pattern, and the intensity of turbulent diffusion. Effluents having lower density than the receiving waters, and discharged from an outfall on the bottom, ascend to the surface as a buoyant plume, entraining diluting water en route. Tidal currents advect the polluted volume as an oscillating plume, and turbulent diffusion leads to further dilution of the pollutant. Numerical solutions to time dependent theoretical advection-diffusion equations can be used to depict the probable distribution of a pollutant in a tidal segment of the estuary centered on the outfall. Exchange of pollutant between tidal segments in the estuary and the ultimate flushing of the pollutant from the estuary are best treated using a 2-dimensional segmented mathematical model of the estuary. (Knapp-USGS)
W69-04559

NEW HORIZONS IN THE FIELD OF TIDAL HYDRAULICS,
Clarence F. Wicker.
ASCE Proc, JHydraul Div, Vol 95, No HY1, Pap 6346, pp 147-160, Jan 1969. 14 p, 9 ref.

Descriptors: *Reviews, *Tidal effects, Model studies, Estuaries, Surveys, Dredging, Navigation, Saline water intrusion, Canals, Harbors, Inlets (Waterways), Research and development, Sedimentation, Water pollution, Path of pollutants, Tidal energy, Waves (Water), Tsunamis.
Identifiers: Tidal hydraulics, Waterways, Tidal surges.

Tidal hydraulics is currently defined to include all aspects of tidal waterways, not merely the rise and fall of the tide and the resultant tidal currents. The states of knowledge in the subdivision of this broad field of engineering are analyzed, and the needs, if any, for new knowledge are determined. The principal subdivisions where there is insufficient information available are found to be: salinity intrusions; shoaling; and criteria for the design of channels for safe and economic navigation by ships. The nature of the research in these subdivisions are described generally, the prospects for success are indicated, and the benefits are stated. (Knapp-USGS)
W69-04579

USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
Waterways Experiment Station, Vicksburg, Miss.
Henry B. Simmons.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6345, pp 125-146, Jan 1969. 22 p, 22 fig, 9 ref.

Descriptors: *Estuaries, *Tidal effects, *Hydraulic models, Saline water intrusion, Reservoir operation, Model studies, Navigation, Sedimentation, Tides, Waste disposal, Path of pollutants.
Identifiers: Delaware Estuary.

A comprehensive hydraulic model of the Delaware Estuary is described, along with the adjustment and verification of the model. Also described are a number of uses made of the model that were not contemplated when the model was designed and constructed. These include, but are not limited to, studies of factors affecting saltwater intrusion; definition of flushing characteristics of the estuary; design on new navigation facilities; improved methods for waste disposal; the need for rehabilitating existing dikes; and the effects of reservoir operation on salt water intrusion. (Knapp-USGS)
W69-04580

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
Corps of Engineers, Philadelphia, Pa. Operations Div.
Carl C. Cable.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6343, pp 103-114, Jan 1969. 12 p, 8 fig.

Descriptors: *Dredging, *Waste disposal, *Silting, *Water pollution, *Water pollution control, Dispersion, Navigation, Water conveyance, Sedimentation, Water quality, Landfills, Channel improvement.
Identifiers: Dredges, Tidal currents.

Various types of dredging plants are described; their capabilities and limitations are listed. The importance of selecting the most suitable disposal method for the job at hand is stressed. Present day emphasis on clean waters dictates that planning be redirected to studying alternate disposal methods to reduce pollutional aspect of some dredging projects. The trend is towards more positive containment of dredged materials to reduce repetitive redredging of material in the ship channels and to provide some control over water quality. (Knapp-USGS)
W69-04581

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
For primary bibliographic entry see Field 05C.
W69-04280

ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
K. G. Barnhill.
American Water Works Association, Journal, Vol 54, No 5, May, 1962, pp 526-528.

Descriptors: *Desalination, *Economic feasibility, *Costs, *Brackish water, *Florida, Demineralization, Separation techniques, Water purification, Water treatment, Saline water, Water types, Feasibility, Atlantic coastal plain, Coastal plains, Geographical regions, Gulf coastal plain, Regions, Southeast U. S.

The author presents estimated costs for desalting three brackish water supplies in Florida. The author draws attention to the fact that many brackish waters can be desalted at much lower cost than is possible with sea water.
W69-04441

THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
F. E. Crever.
Nucleonics, Vol 23, No 9, September, 1965, pp 48-50.

Descriptors: *Desalination, *Economic feasibility, *Nuclear powerplants, *Multiple-purpose projects, Saline water, Demineralization, Separation techniques, Water purification, Water treatment, Powerplants, Engineering structures, Industrial plants, Structures, Water types, Municipal water, Projects, Dual purpose, Feasibility, Project feasibility, Steam turbines, Equipment, Turbines, Electric powerplants.

The author discusses several economic and technical factors related to the economic feasibility of dual-purpose desalination and power plants. Among his conclusions are the following: (1) A common misconception exists that, in combined plants, water is purified with heat that the power-generation portion would otherwise reject. In fact, water can only be obtained at the expense of power. (2) There is little question that light-water reactors can supply energy for desalting at low cost in modest-size plants--about 100 million gallons per day. But when we start considering billion-gpd capacities, we find water transportation over long distances becoming competitive. (3) The combined plant offers other advantages when both products are needed and saleable. The principal benefit derives from decreasing unit cost of nuclear steam-generating equipment with increasing size.
W69-04463

THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
J. W. Milliman.
In WATER PRODUCTION USING NUCLEAR ENERGY, pp 49-73. Tucson, Arizona: The University of Arizona Press, 1966.

Descriptors: *Desalination plants, *Economic feasibility, *California, *Nuclear powerplants, Desalination, Saline water, Costs, Financial feasibility, Economic justification, Economics, Pacific coast regions, Electric powerplants, Industrial plants, Southwest U. S., Geographical regions, Regions, Demineralization, Separation techniques, Water purification, Water treatment, Buildings, Engineering structures, Structures, Powerplants, Water types.

The economics of saline water conversion is discussed, with special emphasis being placed upon (1) alternatives to saline water conversion and (2) the economic issues involved in combined nuclear water and power facilities and the Bechtel Study of the feasibility of a combined water and power plant for Southern California. The author outlines the economic analyses that have been associated with combined nuclear water-power plants in general, and is particularly critical of the Bechtel Study. Among the major points and conclusions reached by the author are the following: (1) All known desalinization processes are capital intensive, (2) Even the most optimistic costs related to desalinization are not low when compared to current water costs and to other water source alternatives, (3) Dual purpose (power and water) plants achieve cost savings, but low costs are sensitive to stable outputs of both water and power, (4) Cities near sea-coasts, which have no obvious fresh water alternatives and which can absorb large blocks of power, would seem to be the best prospects for large-scale combination nuclear-desalting plants.
W69-04483

SALINE WATER CONVERSION REPORT.
Office of Saline Water, U S Department of the Interior, Washington, D. C., 1966.

Descriptors: *Desalination, *Costs, *Water sources, *Federal government, *Water supply, Saline water, Demineralization, Separation techniques, Water purification, Water treatment, Desalination plants, Water types, Nuclear powerplants, Electric powerplants, Engineering structures, Industrial plants, Powerplants, Structures, California, Geographical regions, Pacific coast region, Regions, Southwest U. S., Hudson River, Bodies of water, Rivers, Running waters, Streams, Surface waters, Texas, Central U. S., Coastal plains, Gulf coastal plain, Rio Grande, Interstate rivers.

This report is made annually by the Department of the Interior to the President as required by Public Law 448, 82nd Congress, 2nd session. The report summarizes the program and accomplishments of the Office of Saline Water with emphasis on work completed in the preceding year. Among some of the research mentioned are the following: (1) A dual-purpose nuclear power and water plant producing 150 million gallons/day of water and 1800 megawatts of electricity was studied in relation to feasibility for construction and operation off-shore of Orange County, California. (2) The possibility of using desalting as an alternative source of water in the northeast during drought periods was examined. The results indicated that fresh water supply from the Hudson River currently provides the most economic interim source, but that desalting may offer advantages in the future. (3) A study of saline-water conversion in relation to 37 Texas cities revealed that saline-conversion costs were equal to or less than conventional water supplies in 11 instances and more expensive in 27.9 cities in the lower Rio Grande valley. The 11 instances represent a special case for future study because their needs might be supplied by one or more large-scale desalting plants.
W69-04498

WATER DESALINATION: PROPOSALS FOR A COSTING PROCEDURE AND RELATED TECHNICAL AND ECONOMIC CONSIDERATIONS.
New York: United Nations, 1965.

Descriptors: *Desalination, *Investment, *Costs, Saline water, Demineralization, Separation techniques, Water purification, Water treatment, Water types, Capital costs, Operating costs, Construction costs.

Part I of this report gives a breakdown of the principal cost items to be included under investment for desalination and proposes a procedure to obtain an approximate cost for product water. Part II reviews the technical and economic considerations encountered in the selection, construction, and operation of desalination plants.
W69-04513

THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
Societe Hispano-Suiza, Bois-Colombes (France).
R. Brousee.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash, D C, Vol 2, pp 135-145, 1968. 11 p, 3 fig, 4 tab.

Descriptors: *Desalination, *Flash distillation, *Turbines, *Energy transfer, Distrillation, Electric power, Fresh water, Sea water.
Identifiers: *Turbine gases, France.

Currently distillation is the most frequently employed process in producing fresh water from sea water for it utilizes readily the heat from electric generators, heat which would otherwise be lost. Depending upon the production ratio of electric power to fresh water, one may be considered a by-product of the other. Where gas turbines are used to drive alternators, nearly all the unused potential is in the exhaust gases and installing a recovery boiler will permit efficient production of the steam necessary to operate a flash-type evaporation system. Depending on the rate of instantaneous electric consumption of the system considered, the optimization and the regulation of the production of water under constant conditions will be able to utilize either post-combustion (reinjection of heat into the exhaust gases) or recovery by reheating the air used in combustion. The necessary production of water can thus be greater than, equal to, or less than that which could be produced by the amount of heat contained in the exhaust gases at a given moment. It may be possible to adjust the rate of production of electricity to the amount of water produced. Tables give the power, speed, and yield of selected types of turbines, the production of water by flash systems tied to turbines, and the cost of both electricity and water as determined from such installations. Figures show a diagram of a turbine-evaporation plant, a flow diagram for such a plant, and a chart showing relation of total electricity consumption to percent of turbine power used throughout a 24-hour day. (Vorhis-USGS)
W69-04595

3B. Water Yield Improvement

FRESH WATER,
Mid-Cheshire Water Board (England).
Delwyn Davies.
London, Aldus Books, 1967. 155 p.

Descriptors: *Water resources, *Water quality, *Water resources development, Water treatment, Water pollution, Water pollution control, Water reuse, Water transfer, Municipal water, Domestic water, Industrial water, Irrigation water, Desalination.
Identifiers: Textbooks, Water resources texts, World water resources.

Fresh water sources, water quality, water supply problems, and pollution causes and control are discussed in a general water-supply hydrology text intended for use by the non-specialist. The physical and chemical properties of water that make it vital to life and a major force in geology are described. The uses of water by society for industry, transportation, and human consumption are outlined. Water movement through the hydrological cycle, water resources in lakes, rivers, and aquifers, and the various means of aquisition, control, and distribution of water in various societies are discussed. Water purity and quality are described in terms both of treatment to improve poor water quality and of methods of controlling pollution of good water. Irrigation and water economy are surveyed with stress on use of water for maximum general benefit. Techniques for desalinization are discussed briefly. (Knapp-USGS)
W69-04225

STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04250

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W69-04268

SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
Geological Survey, Washington, D. C.
S. E. Rantz, and T. H. Thompson.
Geol Surv Water-Supply Pap 1851, 1967. 60 p, 10 fig, 1 plate, 13 tab, 15 ref.

Descriptors: *Surface waters, *Runoff, *Precipitation, Drainage, Discharge (Water), Floods, California, Hydrology, Basins.
Identifiers: *San Francisco Bay, *Eel River.

The surface-water hydrology of coastal basins in northern California was analyzed to provide hydrologic data for use in project planning by the California Department of Water Research and other water agencies in the State. Precipitation is distinctly seasonal, 80% of it falling between the November-March period. Average annual natural runoff is about 5.5 million acre-ft and has an areal distribution similar to that of precipitation, ranging from 5 to 85 inches, in a south-to-north distribution. A flood-frequency study of the region indicates that the magnitude of floods at any given frequency can be related to the size of drainage area and to mean annual basinwide precipitation. Average discharges for each selected flood duration and frequency were correlated with drainage area and mean annual basinwide precipitation. (Laverias-USGS)
W69-04273

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02F.
W69-04561

GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 02F.
W69-04564

WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 02E.
W69-04565

WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04587

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W69-04593

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W69-04610

GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W69-04615

GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 02F.
W69-04625

A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
Forest Service (USDA) Parsons, West Va. Northeastern Forest Experiment Station.
J. H. Patric, and John Campbell.
Proc. Northeastern Weed Control Conference 23: 320-328.

Descriptors: *Deciduous forests, *Herbicides, Vegetation regrowth, Plant growth regulators, Foliar application, 2-4-5 T, 2-4 D, *Water yield improvement.
Identifiers: *Experimental watersheds.

Two experimental watersheds on the Fernow Experimental Forest were clearcut and maintained barren with 2,4-D and 2,4,5-T. With 2,4,5-T presently unavailable, a mixture of TBA, 2,4-D, and 2,4-DP has been substituted successfully. Under our conditions of use, the substitute is as effective and economical as 2,4-D and 2,4,5-T for controlling revegetation by eastern hardwoods. (Patric-USFS)
W69-04633

WATERSHED CALIBRATION METHODS,
Forest Service (USDA) Upper Darby, Pa. Northeastern Forest Experiment Station.
Kenneth G. Reinhart.
Reprinted from International Symposium of FOREST HYDROLOGY Proceedings of a National Sci. Foundation Advanced Sci. Seminar held at the Penn. State Univ., Penna. Aug. 29 - Sept. 10, 1965. Pergamon Press, Oxford and New York.

Descriptors: *Rainfall-runoff relationships, Statistical methods, Hydrograph analysis, Water measurement, Deciduous forests, Mathematical models, *Water yield improvement, Streamflow, Watershed management.
Identifiers: *Hydrologic analysis, *Experimental watersheds.

A wide variety of streamflow characteristics can be subjected to analysis; these characteristics can be related to a number of measurable parameters in order to explain most of their variation. The covariance method of analysis is discussed along with changes in procedure to meet different conditions. The natural correlation of the characteristic under study and the parameters to which it is related is the most important factor affecting success. The control-watershed approach has given the best correlations; these might be improved by the addition of precipitation and antecedent discharge variables. It is no longer enough to determine whether a given treatment has a significant effect; we also need to know the amount of change. New and better methods are needed to attain precision for testing mild treatments on portions of watersheds and to evaluate action programs. (Reinhart-USFS)
W69-04634

EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
Forest Service (USDA) Durham, N. H. Northeastern Forest Experiment Station.
James W. Hornbeck, and Charles A. Troendle.
West Virginia Agriculture and Forestry 2 (1): 9-10.

Descriptors: *Rainfall-runoff relationships, Water temperature, Revegetation, Water conservation, *Watershed management, Vegetative conversion, Streamflow.
Identifiers: *Abandoned farmland, *Experimental watersheds.

The U. S. Census of Agriculture reports 9% of West Virginia as abandoned farmland in 1959. Two gaged watersheds were established in 1957 on abandoned farms near Parsons, West Virginia. Despite evidence of severe erosion during farming, turbidity in these streams now is little greater than in forest streams. Maximum water temperatures ranged from 1-3F higher than in forest streams. To date, there is no evidence that natural afforestation is decreasing streamflow. (Hornbeck-USFS)
W69-04635

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
Forest Service (USDA) Upper Darby, Pa. Northeastern Forest Experiment Station.
K. G. Reinhart, A. R. Eschner, and G. R. Trimble, Jr.
U. S. Forest Serv. Res. Paper NE-1, 79 pp, illus.

Descriptors: *Rainfall-runoff relationships, Watersheds (Basins), Deciduous forests, Flow characteristics, Streamflow, Forest management, *Watershed management, *Water yield improvement.
Identifiers: *Timber harvest, *Experimental watersheds.

Four intensities of forest management, ranging from commercial clearcutting to an intensive selection cutting, were applied on calibrated watersheds. Increases in annual flow were related to volume cut. (Reinhart-USFS)
W69-04636

3C. Use of Water of Impaired Quality

CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
E. L. Cronin.
Paper presented to the Eleventh Meeting, Susquehanna River Basin Study Coordinating Committee, Elmira, New York, 1965.

Descriptors: *Salinity, *Oysters, *Bass, *Water quality, *River flow, Bodies of water, Bays, Spawning, Shellfish, Animals, Aquatic animals, Aquatic life, Fish, Freshwater fish, Pan fish, Water properties, Chemical properties, Sunfishes, Wildlife, Benthic fauna, Benthos, Commercial shellfish, Invertebrates, Marine animals, Mollusks, Water levels, Channel flow, Flow, Streamflow.

The author discusses the potential effects of variations in the quantity and qualities of water flowing into the Chesapeake Bay from the Susquehanna River. Discussed are such factors as changes in river flow upon salinity and, in turn, on oysters and the troublesome sea nettle. Also discussed are the potential effects on the spawning area in the Bay for striped bass, reportedly the greatest of such spawning areas in the entire world.
W69-04464

3D. Conservation in Domestic and Municipal Use

HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
Geological Survey, Washington, D. C.
Glenn T. Malmberg.
Geol Surv Water-Supply Pap 1832, 1967. 47 p, 8 fig, 5 plate, 9 tab, 35 ref.

Descriptors: *Water levels, *Carbonate rocks, *Landfills, Reservoirs, Deposition (Sediments), Groundwater movement, Irrigation wells, Withdrawal, Water wells, Nevada, California, Aquifers, Overdraft.
Identifiers: Net pumping draft, Pahrump Valley, Water-level decline.

A reevaluation of the occurrence and availability of the groundwater supply of Pahrump Valley, not considered a hydraulically closed basin, was prompted from observations of the accelerated rate of water-level decline in wells and the decrease in the yields of springs. Investigation revealed 2 reservoir systems: in the valley fill, and in the underlying carbonate rocks. The net pumping draft in the 4-year period 1959-62 averaged about 25,000 acre-ft per yr, which is about twice the estimated perennial yield, or an overdraft of about 13,000 acre-ft per yr. During this period, pumping caused an estimated storage depletion of 15,000 acre-ft per yr. If the overdraft is maintained, depletion of stored water will continue and pumping costs will increase. Water levels near the Pahrump, Manse, and Fowler Ranches declined more than 10 ft in response to the pumping. Recycling of the present good quality water to serve future irrigation purposes could result in water deterioration. (Laverias-USGS)
W69-04267

INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.

N J Stat Ann secs 32:20-11 to 32:20-52 (1963).

Descriptors: *New Jersey, *Delaware River Basin Commission, *Water resources development, *Water supply, Public benefit, Legislation, Delaware River, Delaware, New York, Pennsylvania, Interstate commissions, Water conservation, Water use, Industrial use, Domestic water, Recreational facilities, Public health, Fisheries, Pollution abatement, Navigation, Flood control, Hydroelectric power, Dams, Reservoirs, Aqueducts, Water storage, Conduits, Surface water, Eminent domain, Riparian rights, Salt water intrusion.
Identifiers: *Minimum flow, Integrated water projects.

The Delaware River Basin Water Commission was formed by New Jersey, New York, Delaware and Pennsylvania for the purpose of conserving the water resources of the Delaware River in order that they might be applied so as to benefit all the people of the area. The Commission is designed to insure that an adequate supply of water is available for both domestic and industrial uses. A minimum flow must be ascertained and the Commission is in charge of allocating stored waters. The Commission is empowered to make surveys and construct any dams, reservoirs, and conduits which may be necessary. Each participating state shall supply three members of the council, and the Federal Government may be represented if it so desires. The Commission has the power of eminent domain and may condemn any land or water rights required for its work. It may acquire rights in state owned lands by fee simple conveyance, borrow money and issue bonds to finance its activities, and, may provide for navigation, flood control, and hydroelectric power. All reservoirs constructed shall be available for fishing and recreational uses. (Shevin-Fla)
W69-04427

PUBLIC UTILITIES: METHODS OF SUPPLYING WATER.

N J Stat Ann sec 40:62-49 (1967).

Descriptors: *Legislation, *New Jersey, *Cities, *Water supply, Public utilities, Local government, Water contracts, Water delivery, Supply contracts, Condemnation, Municipal water, Waterworks, Eminent domain, Legal aspects, Financing, Leases.

In order to obtain water, a municipality may contract with the district board of water supply commissioners in water supply district where the municipality is located. A municipality may enter into a contract, not to exceed 15 years, to obtain its water supply from another municipality having waterworks. A municipality may contract for water with a water company, such contract not to exceed 30 years. The water company may issue bonds or give a mortgage to raise money for plant expansion. A municipality may acquire by purchase or lease any waterworks or supply from any person or municipality owning it, together with all property, rights, franchises, powers, and interests. Any municipality using the power of eminent domain to acquire waterworks, shall pay as part of the award, such sum as commissioners may fix as the fair value of bills receivable. Any municipality may purchase, condemn, or acquire the necessary land and rights, within or without the municipality, for water supply purposes. It may alter or change the grade of a highway or require railroad and canal structures to be moved. Where the water supply is from more than one source, or the distribution plant to be acquired is connected with the distribution plant of the owner in the adjoining municipality, such municipality may purchase, lease, or condemn the plant in said municipality and the adjoining one. The municipality acquiring such property shall furnish water to the adjoining municipality as long as is ordered by Board of Public Utility Commissioners. (Stewart-Fla)
W69-04695

PUBLIC UTILITIES: MUNICIPALITY AND ITS EXCLUSIVE RIGHT TO SUPPLY WATER.
NJ Stat Ann 40:62-48 (1967).

Descriptors: *Legislation, *New Jersey, *Cities, *Water supply, Water delivery, Pipelines, Water permits, Water contracts, Municipal water, Public utilities, Legal aspects, Pipe flow.
Identifiers: Injunctions (Prohibitory), Injunctions (Mandatory).

Municipalities have the exclusive right to supply water within their geographical limits. No person shall supply water to any other person by means of water pipes conveying water from without the municipal limits without consent of the board having charge of the public water supply. No person within the limits of any municipality shall obtain water by pipes from any source outside municipal limits without consent of said board. Any municipality may enjoin violation of the above provisions. This section shall apply whether or not the water supply furnished by the municipality is obtained by contract or from a plant owned and controlled by the municipality. (Stewart-Fla)
W69-04696

WATER SUPPLY.

N J Stat Ann secs 40:36-1 to 40:36-2, 40:36-4 to 40:36-6, 40:36-10 (1967).

Descriptors: *Legislation, *New Jersey, *Water supply, *Administrative agencies, Municipal waters, Community development, Population, Public benefits, Water contracts, Legal aspects, Pipelines utilities, Water works, Surveys, Local governments, Eminent domain.
Identifiers: *Water supply commission.

Section 1 provides that any county of over 205,000 population may establish a county water supply commission composed of seven members who shall serve without compensation for 2 year terms. Section 2 allows the water supply commission, with the approval of the board of chosen freeholders, to enter into contracts with the direct water supply commission for a technical survey of the potable water supply in the county. Section 4 allows counties of over 350,000 population to establish a county water supply commission composed of five members serving without compensation for three year terms. Section 5 provides that the commission may, with the approval of the board of free-holders, provide water to any municipality in the county by: (1) entering into a contract with any state board, commission or department; (2) entering into contracts with any municipality in the state having water works or with any corporation owning water works; (3) purchasing or leasing any water company supplying water to any municipality within the county; and (4) acquiring the necessary real estate, water rights, and making necessary improvements within or without the state. All property shall be acquired in the name of the county. Section 6 allows the commission to sell the water acquired by it and to lay water mains to accomplish such sale. Section 10 provides that these statutes shall not effect the present powers of the New Jersey Water Policy Commission or the North Jersey District Water Supply Commission. (Heckerling-Fla)
W69-04697

3E. Conservation in Industry

WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
Georgia Univ., Athens. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W69-04205

3F. Conservation in Agriculture

ECONOMIC AND ENGINEERING ASPECTS OF WATER IN DELAWARE'S AGRI-BUSINESS INDUSTRY,
Raymond C. Smith.
Technical Research Project Completion Report, February, 1969. 10 p. OWRR Project B-001-DEL.

Descriptors: *Water requirements, *Water demand, *Planning.

The use of supplemental irrigation in Delaware expanded from 5,553 acres in 1954 to 17,542 acres in 1964. On the basis of acres irrigated in 1964, approximately 660 million gallons of water would be used for supplemental irrigation in a year of above average rainfall. Approximately 1,650 million gallons of water would be used in years of low rainfall. In years of low rainfall, the annual use of water for irrigation is approximately equal to the average daily flow of streams in the State for one day. Production function analysis indicated irrigation resulted in an average increase of 461 pounds in asparagus yields in 1967. Water use and waste disposal were studied in six vegetable processing plants. Waste disposal loads were determined by the average pounds of BOD and the average waste flow per case. There was a wide variation in water used per case between plants producing the same product and between products. There is a tendency to use the same absolute amount of water regardless of the amount of product being packed. The cost of intake water varied from 4 to 13 cents per 1,000 gallons. Waste disposal costs varied from 4 to 34 cents per 1,000 gallons of waste water.
W69-04204

MAJOR USES OF LAND AND WATER IN THE U. S.; WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
H. Thomas Frey, Orville E. Krause, and Clifford Dickason.
U S Department of Agriculture, Agricultural Economic Report, 149, pp 1-74, Nov 1968. 74 p, 12 fig, 2 map, 1 photo, 33 tab, 19 ref, 1 append.

Descriptors: *Water utilization, Drainage effects, Irrigated lands, Cultivated lands, Dry farming, Land use, Agriculture.

This report continues the data series on major uses of land and water in the United States, with special reference to agriculture, published at 5-year intervals by the U.S. Department of Agriculture. Acreage data are obtained from many sources and articulated to form a summary account of the extent and distribution of land in each sub-category and in each major category of land use (cropland, pasture and range, forestland, and urban and other special uses) by State and regions as well as U.S. totals. Acreages irrigated and dry-farmed, acreages drained, and other information on water-use practices related to agriculture are also shown by State and region. In 1964, nearly three-fifths of the land area of the U.S. was used to produce crops and livestock, a fifth was ungrazed forest land, 8 percent was in special uses (of which a third is in urban and transportation uses and two-thirds in generally extensive public areas such as parks) and the remainder--12 percent--in desert and other land of limited surface use. Agricultural irrigation on 38 million acres in 1965 accounted for 41 percent of the nation's total water withdrawal from stream or ground sources.
W69-04208

IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
NJ Stat Ann secs 40:31-1 to 40:31-3 (1967).

Descriptors: *Administrative agencies, *New Jersey, *Irrigation systems, *Water sources, Irrigation programs, Pipes, Legislation, Water law, Construction, Operation and maintenance, Legal aspects.

A board of chosen freeholders may establish an irrigation system. The board is given the power to purchase real estate and water rights, erect buildings, and to purchase and install machinery deemed necessary for the establishment of the irrigation system. It is also given the power to lay pipes where necessary to reach the property lines of its customers. The board is allowed to tap any river, stream, lake, or other water sources in order to supply the system and is given the power to charge reasonable rates for the use of the water. Further, the system can be extended to other counties, provided such counties consent to the extention. (Holt-Fla)
W69-04416

SILICA IN STREAMS AND GROUND WATER OF HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 02G.
W69-04528

AGRICULTURAL DEVELOPMENT AND EXPANSION IN THE NILE BASIN; PROGRAMS, PRODUCTION AND IMPLICATIONS FOR U. S. AGRICULTURE,
Economic Research Service, Washington, D. C. Foreign Regional Analysis Div.
Cline J. Warren.
U S Department of Agriculture, Agricultural Economic Report 48, pp 1-114, Oct 1968. 114 p, 11 fig, 1 map, 1 dwg, 44 tab, 33 ref, 1 append.

Descriptors: *Dams, Crop production, Cultivated lands.
Identifiers: *Nile Basin.

This report considered the increase in farm production that might be expected during the next decade in the Nile Basin. The implications of increased farm production are appraised both from the standpoint of their probable impact on local economies and the international market for farm products. Special attention is given to the affect development projects will have on the production and trade of products that compete with U. S. farm exports. Cotton will likely continue to be the most important crop within the Nile Basin for some years to come. Indications are that a large bread grain deficit will still exist in the UAR by the time the full impact of the High Dam is realized. A realization of anticipated expansion in cotton production in the Nile Basin will have a decided impact on the world's cotton situation within the next decade. While extra long staple cotton from the area competes indirectly with U. S. cotton on the world market, short staple varieties compete directly with U. S. foreign sales. Sudanese shipments of surplus feed grains will compete with U. S. exports to Western Europe. Potential exports of oilseeds, citrus, and vegetables could also be a source of increased competition for U. S. sales abroad of these commodities.
W69-04641

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FLOOD PLAIN INFORMATION, CALCASIEU RIVER, OAKDALE, LOUISIANA.
Switzer (Albert) and Associates, Inc., Baton Rouge, La.

Prepared for City of Oakdale. Corps Eng Flood Plain Rep, Aug 1968. 55 p, 6 fig, 19 plate, 12 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Louisiana, Maximum probable flood.
Identifiers: Oakdale (La), Calcasieu River (La), Standard project flood, Intermediate regional flood.

Flooding of the Calcasieu River at Oakdale, Louisiana is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04215

FLOOD PLAIN INFORMATION, KERN RIVER, KERNVILLE, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.

Corps Eng Flood Plain Rep, May 1968. 29 p, 7 fig, 11 plate, 5 tab. Prepared for Kern County.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, California, Maximum probable flood.
Identifiers: Kernville (Calif), Kern River (Calif), Standard project flood, Intermediate regional flood.

Flooding of the Kern River, Kernville, California is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04216

FLOOD PLAIN INFORMATION, LAS CHOLLAS CREEK, SAN DIEGO COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.

Prepared for San Diego County and San Diego City. Corps Eng Flood Plain Rep, Mar 1968. 36 p, 14 fig, 16 plate, 10 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, California, Maximum probable flood, Historic flood, Flood protection.
Identifiers: San Diego County (Calif), Las Chollas Creek (Calif), Standard project flood, Intermediate regional flood.

Flooding of Las Chollas Creek, San Diego County, California is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04217

FLOOD PLAIN INFORMATION, FEATHER AND YUBA RIVERS, MARYSVILLE-YUBA CITY, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.

Prepared for Calif State Reclamation Board, and Butte, Sutter, and Yuba Counties. Corps Eng Flood Plain Rep, June 1968. 55 p, 30 fig, 11 plate, 9 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, California, Maximum probable flood.
Identifiers: Marysville (Calif), Yuba City (Calif), Feather River (Calif), Yuba River (Calif), Standard project flood, Intermediate regional flood.

Flooding of the Feather and Yuba Rivers, Marysville and Yuba City, California is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04218

FLOOD PLAIN INFORMATION, PAYETTE RIVER, PAYETTE, IDAHO AND VICINITY.
Corps of Engineers, Walla Walla, Wash.

Prepared for the County of Payette. Corps Eng Flood Plain Rep, Sept 1968. 31 p, 7 fig, 11 plate, 4 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Idaho, Maximum probable flood.
Identifiers: Payette (Idaho), Payette River, Intermediate regional flood, Standard project flood.

Flooding of the Payette River, Payette, Idaho, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04219

FLOOD PLAIN INFORMATION, SANTA CLARA RIVER (SATICOY TO PACIFIC OCEAN), VENTURA COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.

Corps Eng Flood Plain Rep, June 1968. 36 p, 15 fig, 17 plate, 8 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, California, Maximum probable flood, Historic flood, Flood protection.
Identifiers: Santa Clara River (Calif), Saticoy (Calif), Standard project flood, Intermediate regional flood.

Flooding of the Santa Clara River, California is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04220

FLOOD PLAIN INFORMATION, JOHNSON CREEK, ARLINGTON AND GRAND PRAIRIE, TEXAS.
Corps of Engineers, Fort Worth, Tex.

Corps Eng Flood Plain Rep, Dec 1968. 43 p, 8 fig, 15 plate, 11 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Texas, Maximum probable flood.
Identifiers: Johnson Creek, Arlington (Tex), Grand Prairie (Tex), Intermediate regional flood, Standard project flood.

Flooding of Johnson Creek, Arlington and Grand Prairie, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04221

FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D. C.
Howard E. Allen.
Geol Surv Hydrol Invest Atlas HA-256, 1 sheet, 1968. 12 fig, 3 tab, 2 ref.

Descriptors: *Floods, *Illinois, *Flood plains, Flood damage, Flood control, Non-structural alternatives, Stage-discharge relations, Hydrologic data, Gaging stations.
Identifiers: Woodstock (Ill), Flood profiles, Flood frequencies, Crest-gaging stations.

Floods in the Woodstock quadrangle, northeastern Illinois, are described in a 1-sheet hydrological atlas. A map, scaled 1:24,000, shows the flooded areas of the 1943, 1963, 1966, and 1967 floods, and locations of gaging stations. Flood frequencies and flood profiles are shown graphically. The flood data may be used to evaluate economic development of flood plains in the area, to help individuals, industries, and governments solve flood problems, and to help formulate flood plain regulations, zoning regulations, building codes, and plans for recreational and waste-disposal facilities. (Knapp-USGS)
W69-04249

MARITIME AGENCY STATUS, CHANNEL PROBLEMS CREATED BY HUGE SHIPS CONCERNS OF AAPA.

Traffic World, Vol. 131, No. 14, September 30, 1967, pp 25-29, 100-105.

Descriptors: *Channel improvement, *Harbors, *Ships, Transportation.

This report on the annual convention of the American Association of Port Authorities covers three economic issues: (1) the advantages of specialized ports, (2) the limitations to harbor and channel deepening, and (3) the importance of efficient use of land loading and transportation facilities.
W69-04287

PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
Bureau of Sport Fisheries and Wildlife, Vero Beach, Fla.
A. R. Marshall.
Report, 1967.

Descriptors: *Marshes, *Landfills, *Dredging, *Aquatic habitats, *Florida, *Fish, Silts, Habitats,

Environment, Food chains, Food habits, Breeding, Spawning, Natural resources, Wetlands, Conservation, Wildlife, Animals, Wildlife conservation, Bays, Bodies of water, Bayous, Atlantic coastal plain, Coastal plains, Geographical regions, Gulf coastal plains, Regions, Southeast U. S., Animal behavior, Behavior, Resources.

Direct and indirect effects of dredging and filling on the fish and wildlife resources of Florida's estuarine and freshwater habitats are discussed. Aspects of the problem discussed include: direct destruction of swamp, marsh, and bay bottom habitat in the immediate project area; destruction of spawning and nursery habitat by siltation; reduction of light penetration; creation of anaerobic bottom conditions; reduction of nutrient outflow from marshes and swamps. Specific examples are cited for Boca Ciega Bay, Tampa Bay, Biscayne Bay, Indian River, and St. John's River.
W69-04288

1967 PROCEEDINGS OF WODCON.
World Dredging Conference, Palos Verdes Estates, California, May, 1967.

Descriptors: *Dredging, *Reclamation, *Mining, *Sediments, *Sampling, Land reclamation, Coastal engineering, Engineering, Hydraulic mining.

This is a compilation of the papers read at the World Dredging Conference, May 6-8, 1967, held in New York City. Topics covered were: dredge design, coastal and reclamation dredging, sediment sampling systems, Dredging developments, and ocean mining.
W69-04321

REMARKS BY BRIGADIER GENERAL JOHN A. B. DILLARD, DIVISION ENGINEER, SOUTH PACIFIC.
Report, San Joaquin and Contra Costa Navigation Interests, Concord, California, January 20, 1967.

Descriptors: *California, *Ships, *Economic impact, Transportation, Navigation, Civil engineering, Engineering.

The author's remarks cover the relation of deep draft shipping to regional economic development. Local industry has become more and more dependent on low-cost sea transportation. The author suggests a central loading and unloading station for oil and bulk products, thus requiring only one deep draft channel across the Bar in the port of Stockton, California.
W69-04324

TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
Clyde H. Slease.
Estuarine Hearings, Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, House of Representatives, 90th Congress, Serial No. 90-3, March, 1967.

Descriptors: *Sands, *Dredging, *Gravels, *Estuarine environment, *Forecasting, Construction materials, Earth materials, Pervious soils, Soil types, Aquatic environment, Environment.

During the 30-year period, 1962-92, an estimated 42 billion tons of sand and gravel will be produced. Presently held reserves will be exhausted in about 20 years. Approximately 10 percent of production is from waterways, and most of this is estuarine. The author does not believe that sand and gravel dredging is incompatible with fish and wildlife interests and opposes the bill before Congress because he fears that dredging interests will be restricted.
W69-04340

THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
James E. Sykes.
32nd North American Wildlife and Natural Resources Conference, San Francisco, California, Transactions, March 13-15, 1967, pp 150-160.

Descriptors: *Land management, *Landfills, *Environmental effects, *Research and development, Dredging, Legal aspects, Land forming, Ecology, Management, Impaired water quality, Water quality, Erosion, Conservation, Fishing.

The author cites landfill as a serious problem in many estuaries. Until the early nineteen sixties, little attention was paid to the ecological imbalances resulting from dredging and filling. One dredge-fill case is cited which set a precedent, inasmuch as it considered the data and evidence presented by marine biologists concerning the value of commercial and sport fishing of the area. The author identifies other problems for estuarine research: (1) Altered circulation can cause erosion; (2) Dwellings built on new land masses are frequently exposed to hurricanes and sea storms; (3) Water quality, a factor related to biological production, recreation, and public health, is being neglected.
W69-04347

WATERSIDE SITE PLANT LOCATIONS AND EXPANSIONS 1966.
Report, American Waterways Operators, Inc., Washington, D. C., March, 1967.

Descriptors: *Construction, *Sites, *Industrial plants, *Statistics, Rivers, Bays, Harbors, Bodies of water, Running waters, Streams, Surface waters, Buildings, Engineering structures, Structures, Data collections.

The American Waterways Operators, Inc., has kept records on the growth of industrial waterside production facilities and water-borne commerce shipping facilities for the past 14 years (since 1953). This booklet, one of a continuing series which started in 1961, lists the individual facilities built, expanded, or planned for construction on waterfront sites in 1966, by individual rivers and bays.
W69-04361

THE ZUYDERZEE WORKS.
Netherlands Government, Information Service, The Hague, Netherlands, 1967.

Descriptors: *Land reclamation, *Dam construction, *Foreign countries, Coastal engineering, Erosion, Shore protection, Agricultural engineering, Saline water intrusion, Soil treatment, Geographical regions, Regions, Construction, Engineering.

The technical progress of land reclamation from the Zuiderzee and construction of the Barrier Dam is described. Problems of salification, flushing, erosion, and treating soil are discussed. Pumping, dyke construction, and soil distribution are described.
W69-04365

WATERWORKS AND WATER SUPPLIES.
Ala Code tit 22, secs 117-140 (1958).

Descriptors: *Alabama, *Water supply, *Waterworks, *Administrative agencies, Regulations, Legislation, Permits, Water pollution control, Adoption of practices, Water management (Applied), Legal aspects, Investigating construction, Sampling, Water analysis, Supervisory control (Power), Potable water, Cities.

The state board of health has supervision and control over water supplies and waterworks. Every person, firm, corporation, or institution who furnishes water for human consumption must deliver monthly to the state laboratory samples of water furnished to consumers. A record shall be kept of the analysis of such samples. A petition for permission to furnish or supply water for human consumption must be filed with the board along with the complete plans for such water supply system. No permit is required for private property supplying less than 50 persons. After a permit is filed for the board shall conduct a complete investigation and hearing into the proposed changes. The board may order changes upon findings of impure or unwholesome water. All permits issued are revocable or subject to suspension if the water being supplied is impure. The board has the right to make investigations at any time and may require a full report on the condition of the waterworks system of any permit holder. A permit is required to construct a waterworks system. An injunction may issue against any violators of this chapter. It is unlawful to pollute the water supply of a town or city, supply polluted water to consumers, supply water without a permit, and impound water from construction work. Orders of the board may be appealed to the court of competent jurisdiction. (Sisserson-Fla)
W69-04367

HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
71 York 89-93 (CP Pa 1957).

Descriptors: *Pennsylvania, *Riparian rights, *Natural flow doctrine, *Obstruction to flow, Judicial decisions, Riparian land, Dams, Legal aspects, Water law, Diversion, Flood damage, Flooding.
Identifiers: Injunctions, Trespass.

Defendant owned land below and adjacent to Plaintiff. Plaintiff sought a mandatory injunction commanding removal of a dam on defendant's property. In addition, he proved damages due to overflow caused by the dam. Prior to 1953, a natural stream flowed through defendant's land and nowhere touched plaintiff's land. Plaintiff's land had always been dry. During the years 1953-1955, defendant dumped debris into the stream, causing water to be diverted onto plaintiff's land; this, in turn, resulted in continuous flooding and damage to plaintiff's land. Defendant unsuccessfully attempted to divert the water into a ditch. The court held that defendant was liable for damages to plaintiff's land that an injunction would issue ordering removal of the dam. The owner of lands higher up the stream has the right to have the waters flow over his land as they would naturally flow. Riparian proprietors are entitled to have the stream which washes their land flow naturally and without material diminution or alteration. One who constructs a ditch to divert a natural stream has a duty to maintain such ditch in a reasonable and proper condition; he is liable for damage resulting from flooding of other lands caused by his failure to do so. (Holt-Fla)
W69-04373

WHARVES AND FISH WEIRS.

Me Rev Stat Ann tit 38, secs 1021-1026 (1965).

Descriptors: *Legislation, *Maine, *Docks, *Weirs, Fishing, Commercial fishing, Cities, Tidal waters, Rivers, Nets, Trapping, Fish, Administrative decisions, Industries, Permits, Islands, Riparian owners, Legal aspects.

These sections pertain to wharves and fish weirs. Section 1021 defines a 'fish weir' as a fixed structure in tidewater constructed of stakes surrounded by brush or netting, forming the catch pound into which fish are led and from which they cannot readily escape. Section 1022 provides for the licensing of anyone intending to build or extend any wharf, fish weir, or trap in tidewaters within the limits of any city or town. Application shall be in writing to municipal officers. The applicant shall give a bond of $500. The applicant may appeal an adverse determination to the Superior Court within 10 days. The owners of islands outside the jurisdiction of any town shall make a determination as to the issuance of such license. Section 1023 makes

the license void unless the weir or trap is built within one year or before July 15th in any year. Section 1024 provides for consent by municipal officers of two towns if the wharf or weir is in a river or tidewater lying between them. Section 1025 provides for the recording of applications made under section 1022 and for reasonable compensation to be paid by the applicant to the municipal officers for their services, to the clerk for recording, and for an additional $5 if the license is granted. (Heckerling-Fla)
W69-04379

GENERAL POWERS OF THE BOARD OF TRUSTEES.
N Y Village Law secs 89.15, 89.16 (McKinney 1966).

Descriptors: *New York, *Flood damage, *Erosion, *Public benefits, Legislation, Municipalities, Drains, Culverts, Dams, Bulkheads, Dredging, Watercourses, Condemnation, Construction, Reservoir operation, Water supply, Aqueducts, Wells.
Identifiers: *Villages, *Board of Trustees.

The board of trustees for a village may, for the purpose of preventing damage to property within the village from floods or erosion, construct drains, culverts, dams and bulkheads, dredge channels, and regulate watercourses, ponds and watering places within or without the village. They may acquire property by purchase or condemnation. If such land is outside the limits of the village, consent of the governing body of the area in which the land is located is required. Consent may only be given after a public hearing is held. No liability will be imposed on the city giving consent, and all responsibility for maintenance and repair will be with the village making the improvement. The cost of the work shall be charged against the village and shall not be wholly against the owners of the property benefited unless consented to by the owners of at least 2/3 in amount of the assessed valuation of the taxable real property against which the improvement is to be assessed. The board of trustees of the village may also establish, regulate and repair public reservoirs, aqueducts, pumps, wells, fountains, and watering and drinking places. (Shevin-Fla)
W69-04393

NAVIGABLE WATERS OF THE STATE.

N Y Navigation Law Art 1, secs 30, 31, 32, 33, 34, 35, 36, 37 (McKinney 1966), as amended and supplemented, N Y Navigation Law Art 1, secs 30, 31, 32, 32-a, 32-b, 32-c, 33-a, 33-b, 33-c, 34, 34-a, 35, 35-a, 36, 37, 38 (McKinney Supp Dec 1968), 17 p.

Descriptors: *New York, *Navigation, *Pollution, *Navigable waters, Legislation, Administrative agencies, Excavation, Landfills, Administrative regulation, Buoys, Treatment facilities, Sewage, Water levels, Sanitary engineering, Legal aspects, Permits.
Identifiers: Obstruction to navigation, Regattas, Aids to navigation.

The commissioner of conservation has jurisdiction over navigation on the navigable waters of the state and shall enforce the provisions of this chapter. It is made unlawful to excavate, place fill in, or erect structures in or on navigable waters, without first obtaining a permit. Except as permitted by statute, the use of a net or weir in the Hudson River is a misdemeanor. Lights are required to be maintained on swing bridges across the Hudson River. It is made a misdemeanor to interfere with navigation. Sanitary facilities aboard craft on Lake George and Greenwood Lake must not discharge pollutants into the waters of the lake. The dumping of trash in Chautauqua Lake is prohibited. The act regulated the disposal of sewage and littering of waters of the state. The conservation commissioner may authorize the placing of aids to navigation in the navigable waters of the state. This chapter also applies to privately owned navigable waters. The chapter provides for the maintenance of the water level of Lake George within certain limits. (Childs-Fla)
W69-04397

TIDEWATER NAVIGATION.

N Y Nav Law secs 80, 81, 82, 83, 84, 85, 86 (McKinney 1966), as amended, N Y Nav Law secs 82, 86 (McKinney Supp 1968).

Descriptors: *New York, *Navigation, *Diversion, *River regulation, Legislation, Cities, Streams, Depth, Taxes, Navigable waters, Tidal waters, Alteration of flow, Width.
Identifiers: Tidewater creek.

A municipal corporation diverting a fresh water stream flowing into an estuary or tidewater creek previously navigable by vessels of at least 20 tons must maintain a depth of at least 3 feet below the low water mark to the head of the tidewater for the full natural width of such creek. However, in Nassau County only a 50 foot width is required. Procedures are established for giving a notice requiring the municipal corporation to restore such stream to the required depth. The superintendent of public works shall determine the depth of such stream in the event of any controversy. After 15 day notice has been given to the municipal corporation, an injunction may be obtained restraining the municipal corporation from any further diversion until the proper depth has been restored. These provisions also apply to any other person diverting any stream as described above. A penalty is prescribed for continuing to divert a stream without maintaining the required depth. The method of collecting revenues for the payment of any work required by the city of New York is provided. This act is amended and annotated. (Childs-Fla)
W69-04398

RIVERS AND STREAMS AS PUBLIC HIGHWAYS.
For primary bibliographic entry see Field 06E.
W69-04399

RIVER IMPROVEMENT.

N Y Conserv Law sec 610 (McKinney 1967).

Descriptors: *Check structures, *New York, *River regulation, *Flood control, Legislation, Floods, Damages, Alteration of flow, Dikes, Flood protection, Legal aspects, Financing.
Identifiers: Regulation of flow.

Construction of dikes, regulation of the flow of a river, and channel improvement to protect against flood damage is provided for. The owners of the properties and political subdivisions benefited by such work are to pay the costs. (Childs-Fla)
W69-04401

ABANDONMENT OF CANAL LANDS.
For primary bibliographic entry see Field 06E.
W69-04402

FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.

N Y Unconsol Laws secs 1308, 1309, 1309a (McKinney Supp 1968). 2 p.

Descriptors: *New York, *Flood control, *Projects, *Eminent domain, Administrative agencies, Cities, Maintenance, Operation and maintenance, Ownership of beds, Legislation, Streams, Lakes, Right-of-ways, Maps, Compensation, Legal aspects, Local governments, Conservation.

The Commissioner of Conservation may, when he deems it necessary, immediately acquire any property which is in the bed or beds of any streams, lakes, streets, roads, highways or rights of way for purposes connected with flood control projects. Once a description and map is filed in the Office of the County Clerk, title to such property transfers to the State of New York. A provision is made for recovery, by the previous owner, of the value of the property so appropriated. Completed flood control projects shall be maintained and operated by the Commissioner of Conservation. Municipalities may be allowed to assume the obligation of maintenance and operation of minor projects. The Commissioner is authorized to use for flood control purposes any property under his jurisdiction acquired for other public purposes. Transfer of such use is effected by an official order of the Commissioner. (Sisserson-Fla)
W69-04403

CANAL COMPANIES - POWERS AND DUTIES.
N J Stat Ann secs 48:6-16, 48:6-22, 48:6-23 (1940); N J Stat Ann secs 48:6-14 to 48:6-15.1, 48:6-17, 48:6-19, 48:6-21 (1968 Supp).

Descriptors: *New Jersey, *Canals, *Condemnation, *Canal construction, Legislation, State governments, Cities, Canal embankments, Navigation, Bridges, Legal aspects, Local governments, Maintenance.
Identifiers: Feeders.

This section initially provides the canal companies with the following powers: entry upon all lands to survey and locate the route of the canal; to buy all necessary lands; to construct, operate and maintain all canals authorized by the state; to charge tolls for canal use; etc. The statute also allows for the borrowing of money by the canal companies through the issuance of bonds secured by a mortgage on the canal property and franchise. The canal companies are further allowed to abandon a feeder located in a municipality and not have to maintain that feeder in a navigable state. The statute requires that each company provide adequate bridges and passages over or under the canal where a road or highway crosses it. Also, no canal will be constructed which exceeds two hundred and fifty feet in width unless more land is required for the slopes of cuts and embankments. Finally, the statute prohibits the construction of canals within the limits of an incorporated city. (Logan-Fla)
W69-04405

PUBLIC UTILITIES - CONSTRUCTION AND OPERATION OF DAMS.

NJ Stat Ann, secs 48:7-7 to 48:7-12 (1968-69 Supp).

Descriptors: *New Jersey, *Dams, *Dam construction, *Public utilities, Legislation, State governments, Electric power, Electricity, Embankments, Reservoirs, Backwater, Aqueducts, Culverts, Locks, Bridges, Canals, Weirs, Gates, Turbines, Pumps, Generators, Outlet works, Penstocks, Tunnels, Fish passages, Rivers, Streams, Navigation, Condemnation, Eminent domain, Low water mark.

These statutes discuss and authorize all corporations concerned with electrical power and its production, transmission, etc., to construct, maintain, repair, etc., all required dams and their works as long as the flow back and raising of the waters behind these dams does not exceed ten feet above common low water of that river or stream. Any height over ten feet would require specific state authorization. Through the right of eminent domain, the corporations also may exercise the power of condemnation subject of course to state approval of the necessity for use of this land by the corporation. The state reserves the right to require certain dams to be constructed so as not to impede navigation and to provide a passageway for fish. (Logan-Fla)
W69-04406

CONSTRUCTION OF CONVENTION HALL PIER.
N J Stat Ann secs 40:179-109 to 40:179-112 (1967).

Descriptors: *New Jersey, *Piers, *Parks, *Recreational facilities, Recreation, Land use, Legislation, Public health, Cities, Oceans, Condemnation, Structures, Construction, Costs, Contracts, Financing, Legal aspects, Eminent domain.
Identifiers: *Convention Hall Pier, *Public resort, Right of notice.

Any city which has planned a public park or public resort which has not yet been completed may pass an ordinance to cause or permit to be erected on such park or resort a public convention hall pier for public recreation. The city shall have the right of purchase or condemn all lands required for the project, and it may borrow money and issue bonds to finance such purhcase or condemnation proceedings. In the alternative, the city may authorize the purchase and construction of the facility and its lease for a term of years by private parties with ultimate reversion to the city free of indebtedness. The city will have full control over the use, admission charges, commodities sold, and letting out of the facility. All net income received in the operation of the hall shall be applied exclusively to its maintenance and to the retirement of debt insured in its construction. The hall may extend 5000 feet beyond the boundaries of the park, provided such extension is toward the ocean. If a city desires to pass such an ordinance, it must publish notice two weeks in advance of such passage in order that any interested party may raise objections. (Shevin-Fla)
W69-04412

BRIDGES OVER CERTAIN TIDAL WATERS; CHANGING COURSE OF STREAM.

N J Stat Ann secs 27:19-20, 27:19-21, 27:19-22 (1966).

Descriptors: *New Jersey, *Navigable waters, *Bridges, *Diversion, Routing, Legislation, Regulation, Boundaries, Damages, Condemnation, Legal aspects, culverts, Alteration to flow, Bridges.
Identifiers: Obstruction to navigation.

The legislature must give express permission for the construction of any fixed structure over or in any part of the navigable tidal waters separating this state from any other state. The erection of docks and wharves is not forbidden. After giving notice, there shall be no liability for damages occasioned by obstructing navigation caused by repairing or rebuilding a bridge, culvert or viaduct. The board of chosen freeholders may acquire land for the purpose of changing the course of a stream so that it will then pass at right angles to the bridge to be constructed. These sections are annotated. (Childs-Fla)
W69-04417

BRIDGES TO CONFORM TO WHARF LINES.

N J Stat Ann sec 27:19-18 (1966).

Descriptors: *New Jersey, *Bridges, *Navigation, Legislation, Piers, Regulation, Legal aspects, Abutments, Foundations.
Identifiers: Wharf line, Obstruction to navigation.

Viaducts, bridges and piers, or foundations or abutments thereof, must comply with pier and wharf lines fixed by any proper authority. Any viaduct or bridge capable of interfering with navigation must be provided with a suitable draw. (Childs-Fla)
W69-04423

HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).

45 N J Super 409, 133 A 2d 336-340 (1957).

Descriptors: *Drains, *Artificial use, *Repulsion (Legal aspects), *Riddance (Legal aspects), New Jersey, Judicial decisions, Storm drains, Reasonable use, Damages, Rupturing, Hurricanes, Rain, Moisture stress, Foundations, Stress, Surface runoff, Drainage water, Precipitation excess, Surface drainage.

Plaintiff sued the defendant Board of Education when the force of surface water being drained from the defendant's athletic field collapsed the foundation wall of the plaintiff's home. The heavy surface flow occurred while a hurricane passed through the area. The defendant alleged that the damage was due to an act of God. The evidence disclosed that the defendant constructed an athletic field on an upslope above the plaintiff's land. Catch basins poured their flow into a common drainage outlet which discharged about 300 feet from the plaintiff's house. At the discharge point the outlet was 25 feet higher than the plaintiff's lot. The trial court found for the plaintiff and this court affirmed. The damage to the plaintiff's home was not caused solely by an act of God, but that a contributing cause was the defendant's expelling of surface water through an artificial device. When there has been a finding of a wrongdoing which is an efficient and cooperative cause of a mishap, the wrongdoer is not relieved from liability by proving that an act of God was a concurring cause. This state has recently moved from the so called 'common enemy' to a more realistic and flexible standard, the doctrine of 'reasonable use.' Under the new doctrine each possessor is legally privileged to make a reasonable use of his land, even though the flow of surface waters is altered thereby and causes some harm to others. A defendant renders himself absolutely liable if by means of an artificial device (drains, ditches) he causes surface water to flow in larger amounts or in directions other than it would naturally flow causing injury to others. (Blunt-Fla)
W69-04429

LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
D. L. Wheeler.
Land Economics, Vol 41, 1965, pp 376-382.

Descriptors: *Land reclamation, *Land development, *Cultivation, *Dikes, *Foreign countries, Marshes, Wetlands, Land management, Soil management, Management, Earthworks, Embankments, Geographical regions, Regions, Engineering structures, Hydraulic structures, Structures, Surface drainage, Drainage.

Work was started in 1952 to drain the Valli Pega marshes on the Adriatic Sea south of the village of Comacchio. A dike was constructed, and the land was drained by 1954. By 1956 the first 900 acres was planted. Today, 6,876 acres are planted to wheat, rape-seed, and lucerne, which are especially well adapted to reclaimed soils. The contraction of the soil as the moisture content is reduced will be the most difficult future problem requiring rebuilding of present structures. Anticipated cost is $4 million; $2,300 per settler for the initial project. The long range plans are to drain 75,000 acres and resettle 7,500 people on the land. Many of these people are fishermen in the area who will be taught how to farm. The gradual development program is designed so as not to upset the economy by destroying the fishing resource before alternatives can be provided to the indigenous population. Reclamation of the entire Valli de Comacchio will cost $5.7 million.
W69-04518

FLOOD PLAIN INFORMATION, RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN.
Corps of Engineers, Detroit, Mich.

Prepared for the Mich Water Resources Comm, Dept of Conservation and Tri-County Reg Planning Comm. Corps Eng Flood Plain Rep, Mar 1968. 43 p, 7 fig, 26 plate, 12 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Michigan, Maximum probable flood.
Identifiers: Red Cedar River (Mich), Ingham County (Mich), Standard project flood, Intermediate regional flood.

Flooding of the Red Cedar River, Ingham County, Michigan is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04529

FLOOD PLAIN INFORMATION, SNAPFINGER CREEK, DEKALB COUNTY, GEORGIA.
Corps of Engineers, Savannah, Ga.

Prepared for DeKalb County. Corps Eng Flood Plain Rep, Mar 1968. 47 p, 26 fig, 42 plate, 13 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Georgia, Maximum probable flood, Historic flood.
Identifiers: Snapfinger Creek, DeKalb County (Ga), Standard project flood, Intermediate regional flood.

Flooding of Snapfinger Creek, DeKalb County, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04530

FLOOD PLAIN INFORMATION, CLEARWATER RIVER, OROFINO AND RIVERSIDE, IDAHO.
Corps of Engineers, Walla Walla, Wash.

Prepared for the city of Orofino and Clearwater County. Corps Eng Flood Plain Rep, May 1968. 32 p, 10 fig, 13 plate, 2 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Idaho, Maximum probable flood.
Identifiers: Clearwater River (Idaho), Orofino (Idaho), Riverside (Idaho), Standard project flood, Intermediate regional flood.

Flooding of the Clearwater River, Orofino and Riverside, Idaho is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04531

FLOOD PLAIN INFORMATION, MILL RIVER, HAMDEN, CONNECTICUT.
Corps of Engineers, Waltham, Mass.

Prepared for the town of Hamden, Conn. Corps Eng Flood Plain Rep, Mar 1968. 38 p, 9 fig, 11 plate, 6 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Connecticut, Maximum probable flood.
Identifiers: Hamden (Conn), Mill River (Conn), Standard project flood, Intermediate regional flood.

Flooding of the Mill River, Hamden, Connecticut is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04532

FLOOD PLAIN INFORMATION, TULE RIVER, SPRINGVILLE, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.

Prepared for Tulare County. Corps Eng Flood Plain Rep, July 1968. 37 p, 19 fig, 21 plate, 8 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, California, Maximum probable flood, Historic flood.
Identifiers: Tule River (Cal), Springville (Cal), Standard project flood, Intermediate regional flood.

Flooding of the Tule River, Springville, California is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04533

FLOOD PLAIN INFORMATION, WALNUT RIVER, WHITEWATER RIVER, KANSAS.
Corps of Engineers, Tulsa, Okla.

Prepared for Kansas Water Resources Board. Corps Eng Flood Plain Rep, April 1968. 59 p, 14 fig, 38 plate, 13 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Kansas, Maximum probable flood, Historic flood.
Identifiers: Walnut River (Kans), Whitewater River (Kans), Standard project flood, Intermediate regional flood.

Flooding of the Walnut and Whitewater Rivers, Kansas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04534

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER AND CLEAR FORK, WILLIAMSBURG, KENTUCKY.
Corps of Engineers, Nashville, Tenn.

Prepared for the city of Williamsburg. Corps Eng Flood Plain Rep, Jan 1969. 45 p, 8 fig, 14 plate, 12 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Kentucky, Maximum probable flood, Historic flood.
Identifiers: Cumberland River (Ky), Clear Fork (Ky), Williamsburg (Ky), Standard project flood, Intermediate regional flood.

Flooding of the Cumberland River and Clear Fork, Williamsburg, Kentucky is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04535

FLOOD PLAIN INFORMATION, HALLS MILL CREEK, MOBILE, ALABAMA.
Corps of Engineers, Mobile, Ala.

Prepared for South Alabama Regional Planning Commission. Corps Eng Flood Plain Rep, May 1968. 27 p, 4 fig, 17 plate, 8 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Alabama, Maximum probable flood.
Identifiers: Mobile (Ala), Halls Mill Creek (Ala), Standard project flood, Intermediate regional flood.

Flooding of Halls Mill Creek, Mobile, Alabama, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, Photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04536

FLOOD PLAIN INFORMATION, MERAMEC RIVER, BRUSH CREEK AND FOX CREEK, PACIFIC, MISSOURI.
Corps of Engineers, St. Louis, Mo.

Prepared for city of Pacific, Missouri. Corps Eng Flood Plain Rep, June 1968. 9 fig, 25 plate, 17 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Missouri, Maximum probable flood, Historic flood.
Identifiers: Pacific (Mo), Meramec River (Mo), Brush Creek (Mo), Fox Creek (Mo), Standard project flood, Intermediate regional flood.

Flooding of the Meramec River, Brush Creek, and Fox Creek, Pacific, Missouri, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04537

FLOOD PLAIN INFORMATION, ROANOKE RIVER, AND ROANOKE AND SALEM, VIRGINIA.
Hayes, Seay, Mattern and Mattern, Roanoke, Va.

Prepared for Roanoke Valley Regional Planning Commission. Corps Eng Flood Plain Rep, July 1968. 38 p, 7 fig, 23 plate, 7 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Virginia, Maximum probable flood, Historic flood.
Identifiers: Roanoke (Va), Salem (Va), Roanoke River (Va), Standard project flood, Intermediate regional flood.

Flooding of the Roanoke River, Roanoke and Salem, Virginia, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04538

FLOOD PLAIN INFORMATION, BLACK RIVER, TOWN AND MANSKER CREEKS, POCAHONTAS, ARKANSAS.
Corps of Engineers, Little Rock, Ark.

Prepared for the city of Pocahontas, Arkansas. Corps Eng Flood Plain Rep, Feb 1968. 52 p, 9 fig, 15 plate, 16 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Arkansas, Maximum probable flood, Historic flood.
Identifiers: Pocahontas (Ark), Black River (Ark), Town Creek (Ark), Mansker Creek (Ark), Standard project flood, Intermediate regional flood.

Flooding of Black River, Town Creek, and Mansker Creek, Pocahontas, Arkansas, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04539

FLOOD PLAIN INFORMATION, OHIO RIVER AND TRIBUTARIES, MC CRACKEN COUNTY, KENTUCKY.
Corps of Engineers, Louisville, Ky.

Prepared for Paducah-McCracken County Planning Commission. Corps Eng Flood Plain Rep, April 1968. 53 p, 8 fig, 15 plate, 15 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Kentucky, Maximum probable flood, Historic flood.
Identifiers: Ohio River (Ky), McCracken County (Ky), Paducah (Ky), Standard project flood, Intermediate regional flood.

Flooding of the Ohio River and tributaries, McCracken County, Kentucky is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)

W69-04540

FLOOD PLAIN INFORMATION, ARKANSAS RIVER, NORTH LITTLE ROCK, ARKANSAS.
Corps of Engineers, Little Rock, Ark.

Prepared for the city of North Little Rock. Corps Eng Flood Plain Rep, June 1968. 44 p, 19 fig, 34 plate, 12 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Arkansas, Maximum probable flood, Historic flood.
Identifiers: Arkansas River, Little Rock (Ark), Standard project flood, Intermediate regional flood.

Flooding of the Arkansas River, North Little Rock, Arkansas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04541

FLOOD PLAIN INFORMATION ON CAMP CREEK AND NORTH FORK CAMP CREEK, METROPOLITAN ATLANTA, GEORGIA.
Corps of Engineers, Mobile, Ala.

Prepared for Atlanta Region Metropolitan Planning Commission. Corps Eng Flood Plain Rep, May 1968. 41 p, 4 fig, 23 plate, 14 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Georgia, Maximum probable flood.
Identifiers: Atlanta (Ga), Camp Creek (Ga), Standard project flood, Intermediate regional flood.

Flooding of Camp Creek, Atlanta, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04542

FLOOD PLAIN INFORMATION, MILL CREEK, FORT SMITH, ARKANSAS.
Corps of Engineers, Tulsa, Okla.

Prepared for the city of Fort Smith. Corps Eng Flood Plain Rep, Mar 1968. 35 p, 10 fig, 10 plate, 8 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Arkansas, Maximum probable flood, Historic flood.
Identifiers: Mill Creek (Ark), Fort Smith (Ark), Standard project flood, Intermediate regional flood.

Flooding of Mill Creek, Fort Smith, Arkansas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04543

FLOOD PLAIN INFORMATION, BROOKLYN CREEK, ATHENS, GEORGIA.
Corps of Engineers, Savannah, Ga.

Prepared for the city of Athens. Corps Eng Flood Plain Rep, Feb 1968. 29 p, 13 fig, 10 plate, 5 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Georgia, Maximum probable flood.
Identifiers: Athens (Ga), Brooklyn Creek (Ga), Standard project flood, Intermediate regional flood.

Flooding of Brooklyn Creek, Athens, Georgia, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or be combinations of these approaches. (Knapp-USGS)
W69-04544

FLOOD PLAIN INFORMATION ON SHOAL CREEK, DEKALB COUNTY, GEORGIA.
Corps of Engineers, Savannah, Ga.

Prepared for DeKalb County Board of Commissioners. Corps Eng Flood Plain Rep, Apr 1967. 20 p, 12 fig, 17 plate, 4 tab, 31 ref, 2 append.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural atlernatives, Georgia, Maximum probable flood.
Identifiers: Shoal Creek, DeKalb County (Ga), Standard project flood, Intermediate regional flood.

Flooding of Shoal Creek, DeKalb County, Georgia is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04545

FLOOD PLAIN INFORMATION, PISCATAWAY CREEK, PRINCE GEORGES COUNTY, MARYLAND.
Corps of Engineers, Baltimore, Md.

Prepared for Maryland-National Capital Park and Planning Commission. Corps Eng Flood Plain Rep, Nov 1967. 25 p, 2 fig, 8 plate, 6 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Maryland, Maximum probable flood.
Identifiers: Piscataway Creek (Md), Prince Georges County (Md), Standard project flood, Intermediate regional flood.

Flooding of Piscataway Creek, Prince Georges County, Maryland is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04546

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning; and Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W69-04551

FLOOD PLAIN INFORMATION, POST OAK CREEK AND TRIBUTARIES, SHERMAN, TEXAS.
Corps of Engineers, Tulsa, Okla.

Prepared for the city of Sherman. Corps Eng Flood Plain Rep, Jan 1969. 37 p, 7 fig, 19 plate, 11 tab.

Descriptors: *Floods, *Flood damage, Flood plains, Flood control, Non-structural alternatives, Texas, Maximum probable flood.
Identifiers: Sherman (Tex), Post Oak Creek (Tex), Standard project flood, Intermediate regional flood.

Flooding of Post Oak Creek and tributaries, Sherman, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W69-04576

ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM: THE RHONE,
Compagnie Nationale du Rhone (France).
Claude Gemaehling, and Pierre Savey.
For the 8 Volume Proceedings, see Vol 2, No. 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash DC, Vol 8, pp 375-390, 1968. 16 p, 3 fig, 6 photo.

Descriptors: *River basin development, *Multiple-purpose projects, *Hydroelectric power, *Agriculture, *Navigation, Project purposes, Optimum development plans, Irrigation.
Identifiers: *France, *Rhone, Donzere-Mondragon dam, Pierre-Benite project.

The Rhone River rises in Switzerland, enters France upon leaving Lake Geneva, and debouches into the Mediterranean near Marseille, after flowing 515 km in France. It is one of the largest European rivers with an average flow at its mouth of 1,400 cu m/ sec and exceptional floods of 14,000 cu m/sec. The Rhone in France is managed for hydroelectric power, navigation and irrigation by the Compagnie Nationale du Rhone. Two hydroelectric plants have been built on the upper Rhone and on the lower Rhone; 5 falls have been developed, 2 are being worked on, and 6 are being studied. The entire production of electricity will be 16 billion kwh in an average year. The Rhone is now used by small boats from Lyon to the sea but when completed it will take vessels of 3,000 tons. Agriculture will expand by irrigation and by freeing extensive areas from danger of floods. Over 1.5 million people live on the banks of the Rhone between Lyon and the sea. Building major hydraulic works in dense urban areas is a special problem. The development of the French Rhone includes among its diverse and complex accomplishments the Donzere-Mondragon dam, which once held the world record for height, and the whole Pierre-Benite project, which holds the present power record of this type. (Vorhis-USGS)
W69-04592

A RIVER HARNESSED: THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
J. N. Plichon.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash D C, Vol 4, pp 391-397, 1968. 7 p.

Descriptors: *River basin development, *Multiple-purpose projects, *Optimum development plans, Dams, Irrigation canals, Reservoirs, Flooding.
Identifiers: *France, Durance River, Serre-Poncon dam, Verdon River, Provence.

Electricite de France has harnessed the Durance, a river with a basin of 14,227 sq km and one whose violent floods and extended periods of low waters caused it to be regarded as one of the 'scorges of Provence.' In the last 15 years, it has been transformed into a source of power and agricultural riches. Upstream, the Serre-Poncon dam impounds 1 billion cu m of usable water and controls the regularization; downstream five plants in series run the waters of the Verdon confluent through their turbines and into Berre Lake along a geologically previous course of flow. A network of agricultural canals irrigates the region, which is now free from flood and low-flow problems. (Vorhis-USGS)
W69-04594

USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
Services Techniques de la Ville de Paris (France).
Rene Coulomb.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash, D C, Vol 8, pp 398-407, 1968. 10 p, 3 fig.

Descriptors: *River-basin development, *Multiple-purpose projects, *Flood control, Hydroelectric power, Tourism, Boating, Fishing, Dams.
Identifiers: France, Seine basin, Seine reservoir, Marne reservoir.

The Seine River and its tributaries can cause serious floods in the Paris area during autumn and winter but in summer the flow needs to be increased. To protect against both high- and low-flow dangers, reservoir-dams have been built, four of which were built before 1949. The Seine reservoir-dam (205 million cu m) has just been put into service. The construction of the Marne reservoir-dam (350 million cu m) has just been started and studies are being made on other dam sites upstream from Paris. After giving the main characteristics of these facilities and summarizing their operational specifications, the report explains the major advantages they represent for the entire Seine valley. In addition to regularizing the rate of flow, which provides a large measure of safety to the Paris area, the reservoir-dams make possible the production of hydro-electric power plus development of tourism, boating, and fishing. (Vorhis-USGS)
W69-04596

LOA RIVER BASIN: WATER RESOURCES AND THEIR DISTRIBUTION,
Wulf Klohn.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash, D C, Vol 8, pp 339-349, 1968. 11 p, 1 fig, 1 tab.

Descriptors: *River basin development, *Water distribution (Applied), *Administrative decisions, *Water resources development, Planning, Future planning (Projected), Brackish water, Meteorology, Mining, Copper, Aqueducts.
Identifiers: Chile, Loa River, Chuquicamata, Copper mines, Antofagasta.

The Loa River in northern Chile, whose basin covers 30,000 sq km, is the most extensive basin the country but is almost totally lacking in precipitation. Its average flow is 6 cu m/sec and flow continues year round along a 375 km course. The source of the water is not fully known coming for the most part from watersheds on the left bank that are presumed to be fed by precipitation on the Andean Plateau beyond the low divide of the Loa. Small quantities of snowmelt off of high peaks in the region also feed the river. The river divides the Chilean Desert into the Temarugal Pampas to the north and the Atacama Desert to the south. In the valley, water is not only scarce but often is brackish and soils require delicate treatment to preserve their fertility. The climate has wide daily temperature ranges and very low relative humidity. The Chuquicamata copper mines, the largest of their kind in the world, depend on water of the Loa as do other mines, associated urban settlements, and several seaports with their industries. Downstream tributaries of the Loa add brackish water. The cities of Antofagasta, Tocopilla, and Calama depend on Loa water brought from the mountain by means of long aqueducts. New legal water regulations will permit the State to administer water use most beneficially among conflicting demands from mining, municipal supplies, and agriculture. The paper gives a review of the present situation, indicates results of current research, makes a few recommendations, and sketches a plan for future research. (Vorhis-USGS)
W69-04613

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04616

FLOOD AND POLLUTION CONTROL: A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
Metropolitan Sanitary District of Greater Chicago, Ill.

The Metropolitan Sanitary District of Greater Chicago, 100 East Erie Street, Chicago, Illinois 60611, May 1966, 61 p, 11 map, 5 tab, 7 append.

Descriptors: *Flood control, *Pollution abatement, *Underground storage, *Cost comparisons, *Estimated costs, Design criteria, Sewers, Drains, Reservoirs, Feasibility studies, Overflow, Project planning, Comparative benefits, Estimated benefits, Pumped storage, Power system operations.
Identifiers: *Deep tunnel plan, *Chicago.

After describing rainstorm, flooding and waterway pollution problems in Metropolitan Chicago, the prefeasibility report reviews six alternative underground storage plans. It recommends a comprehensive deep tunnel plan. Engineering design criteria for the plan are considered. The major components of the plan are designed with enough precision to allow prefeasibility cost estimates. They include lateral sewers, new main sewers, vertical drains, an underground reservoir, pumped-storage power, a surface reservoir, and pollution treatment. The costs of underground excavation, of plan components, and of contingency and overhead are given. Comparative flood control benefits are discussed in terms of basement flooding, flooding of industrial areas, land enhancement, and flood reduction on the waterway system. Alternative costs are given. Comparative pollution abatement benefits are not clearcut, because the Deep Tunnel Plan alone will not significantly reduce pollution throughout the entire waterway system. The report gives comparative costs for two methods of storing and treating combined overflows. Possibilities of a better scheme of separating storm and sanitary sewers must be investigated. Potential benefits and costs of tertiary and space treatment require further investigation. The report concludes that the plan merits engineering feasibility studies. Appendices discuss extensively hydrology, geology, water quality, aquifer protection, power, costs, and benefits. (Gossen-Chicago)
W69-04630

CHICAGO TUNNEL DRAINAGE PROJECT: PRELIMINARY EVALUATION OF FEASIBILITY.
Metropolitan Sanitary District of Greater Chicago, Ill.

The Metropolitan Sanitary District of Greater Chicago, Chicago, Illinois, May 1964. 33 p, 5 map, 9 tab, 3 chart.

Descriptors: *Project planning, *Drainage programs, *Underground storage, *Flood protection, Sewerage, Storage capacity, Construction, Reservoirs, Locating, Construction costs, Power system operations, Annual costs, Annual benefits, Financing, Pollution abatement, Use rates, Sediment control.
Identifiers: *Chicago, Incremental costs, Stage development.

Approximately a third of the preliminary study describes the project plan, another third economics, and the final third problems for investigation. It recommends that an underground storage system, combined with storage in a higher level sewer system, be designed for the Chicago flood of record. Capacities, types, and construction of proposed storage structures are discussed. The pumped storage facilities of the project would release water to the lower reservoir during peak power load periods and pump it back to the upper reservoir during off-peak hours. Layout, storage capacity, and alternative locations are discussed. (Gossen-Chicago)
W69-04631

EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
Forest Service (USDA) Durham, N. H. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W69-04635

WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
Corps of Engineers, Atlanta, Ga. South Atlantic Div.

U S Army Engineer Division, South Atlantic, Atlanta, Ga., 30303, Jan 1969. 88 p, 1 map, 26 photo.

Descriptors: *Florida, *Water resources development, *Federal government, *Project planning, Programs, Future planning (Projected), Multiple-purpose projects, Navigation, Planning, Project benefits, Project feasibility, Scheduling, Flood control, Seashores, Shore protection, Project purposes, Maps.
Identifiers: *Corps of Engineers.

A brief description of water resources activities being carried out by the Corps of Engineers in the State of Florida as of January 1, 1969 is given. The functions of the Corps are described, and the process of initiation, authorization, and construction of projects is outlined. Included are sections concerning projects completed, projects underway, and projects authorized but not started. In addition, the status of survey investigations throughout the State is briefly reported. Florida maps showing the locations of navigation, flood control, and shore protection projects are attached. (Wheeler-Fla)
W69-04643

STERKX V GRAVITY DRAINAGE DISTRICT NO 1 OF RAPIDES PARISH (VALUE OF PROPERTY CONFISCATED FOR DRAINAGE PURPOSES).

214 So 2d 552-557 (3rd CCA La 1968).

Descriptors: *Louisiana, *Drainage systems, *Eminent domain, *Condemnation, Judicial decisions, Legal aspects, Contracts, Drainage, Canals, Drainage district, Compensation.

A landowner brought action against a drainage district seeking damages for trespass and compensation for the alleged taking of his land. The drainage district constructed a drainage canal across plaintiff's property. The district had orally agreed with the plaintiff's agent to pay $2,574.40 for the property confiscated. It was agreed that this 'contract' would subsequently be reduced to writing, but this never came about, the court held that an oral contract, entered into with the stipulation that the terms were later to be reduced to writing, is unenforceable between the parties if it is not in fact reduced to writing at a later time. The court then awarded plaintiff $6,032.80, the value of the property taken, which amount was in excess of the $5,024.40 prayed for in the complaint. On appeal, the award was reduced to the amount asked for by plaintiff, plus interest and costs. (Shevin-Fla)
W69-04650

WATER DISTRICTS.
N Y Town Law sec 198 (3) (McKinney 1968).

Descriptors: *New York, *Water districts, *Water works, *Water supply, Legislation, Cities, Regulation, Reservoirs, Utilities, Taxes, Local governments, Water rates, Public health, Legal aspects.
Identifiers: Liens.

After the establishment of a water district, the town board is empowered to construct improvements and regulate the water works for the purpose of supplying water for domestic and commercial uses. Provision is made for the assessment and collection of funds to pay the district's costs. The town board may contract with anyone for a supply of water to be resold to consumers in the district and 'unprotected areas,' except that no water may be sold to any consumer within another water district. The town board has the power to adopt ordinances and regulations for the operation of the district. The town board establishes the water rates to be paid by consumers. Such water charges are a lien upon the real property upon which or in connection with which the water was used. (Childs-Fla)
W69-04655

DISPOSITION OF CANALS AND CANAL PROPERTIES PROHIBITED.

N Y Const Art 15 sec 1 (McKinney 1966) (1953 version), as amended, (Supp 1968).

Descriptors: *New York, *Legislation, *Canals, *New York State Barge, State governments, Leases, Political constraints, Navigation, Legal aspects, Contracts, Regulation.

The legislature shall not sell, lease, abandon or otherwise dispose of the now existing or future improved barge canal, divisions of which are the Erie, Oswego, Champlain, Cayuga and Senaca canals, or of the terminals constructed as part of the barge canal system. No portion of the canal system existing prior to the barge canal improvement, which portion forms a part of the present barge system, may be similarly disposed of either. Such canals and terminals shall remain the property of and be under the control of the state forever. The legislature is given power to grant revocable permits for the occupancy or use of such lands and structures. (Scott-Fla)
W69-04656

BILL OF RIGHTS.
N Y Const Art 1, sec 7 (d) (McKinney 1966) (1953 version), as amended, (Supp, 1968), 1 p.

Descriptors: *New York, *Eminent domain, *Drainage, *Swamps, Legislation, State governments, Public benefits, Social needs, Land reclamation, Surface waters, Dikes, Agricultural watersheds, Drains, Ditches, Compensation, Assessments, Legal aspects.
Identifiers: Constitutions (State).

The use of property for the drainage of swamps and agricultural land is a public use. General laws may be passed permitting the owners of such lands to construct and maintain for drainage any necessary drains, ditches and dikes upon the lands of others, subject to a few certain restrictions. Just compensation must be paid for the taking of lands of another. This compensation, together with the cost of such drainage, may be wholly or partly assessed against any property thereby benefited. No special laws may be enacted for these purposes. (Scott-Fla)
W69-04658

WILLFUL INJURIES TO THE CANALS AND DRAWING WATER FROM THE CANALS.

N Y Penal Law secs 463, 464 (McKinney 1968).

Descriptors: *New York, *Legislation, *Navigation, *Canals, State governments, Laterals, Gates, Reservoirs, Locks, Lighthouses, Bridges, Buoys, Dams, Withdrawal, Boats, Damages, Legal aspects.
Identifiers: Penalties (Criminal).

Anyone who, without authority of law, willfully injures any canal belonging to the state, or any sidecut, feeder, reservoir or other works connected with the canal system; disturbs or injures any boats, locks, lights, lighthouses, beacons, buoys, bridges, buildings or machinery or other things connected with said canal system; or operates or opens, or attempts to operate or open, the machinery or apparatus on or connected with any lock, bridge, dam or gate is guilty of a felony. Anyone who, without authority of law, draws water from any canal, or from a feeder or reservoir of a canal, during the season of navigation of the canal, to the detriment or injury of navigation, is guilty of a crime. (Scott-Fla)
W69-04662

COMMERCE AND NAVIGATION.

N J State Ann secs 12:1-1 to 12:2-22 (1968).

Descriptors: *New Jersey, *Legislation, *Administrative agencies, *Navigation, Harbors, Canals, Transportation, Regulation, State governments, Rivers, Legal aspects, Surveys, Eminent domain, Construction.

The general duties and powers of the Board of Commerce and Navigation and the Director of Commerce and Navigation are set forth. The Board shall: (1) have full control of projects relating to commerce and navigation, except where such control is conferred upon other boards; (2) make such regulations governing the work of the Department of Commerce and Navigation and its employees as are necessary to promote state matters in its charge and shall keep all necessary records on file and available to the public; and (3) acquire certain lands for the New Jersey Ship Canal and donate to the federal government as much land as is necessary for the construction of the canal. The director shall: (1) be subject to the rules and regulations of the board; (2) exercise general supervision over all commerce and navigation projects; (3) enforce all laws relating to the powers and duties of the board; (4) collect information relating to the state's commerce and navigation; and (5) enter upon waterways, or riparian lands to examine and survey. (Helwig-Fla)
W69-04663

KEY SALES CO V SOUTH CAROLINA ELECTRIC AND GAS CO (DAM OPERATOR'S DUTY OF CARE IN REGARD TO FLOODING OF DOWNSTREAM PROPERTY).
290 F Supp 8-29 (D S C 1968).

Descriptors: *Riparian rights, *Reservoir operation, *Water level fluctuations, *Flood control, Peak discharge, Regional floods, Cloudbursts, Dams, Hydro-electric plants, Runoff, Downstream, South Carolina.
Identifiers: Federal Power Commission, Saluda River.

A riparian landowner brought this action against defendant utility company, charging that the latter had negligently constructed and maintained a dam for its hydro-electric plant, and that, as a result, excessive rainfall caused flood waters released from the dam to inundate plaintiff's property. The court found, after an extensive discussion of the evidence, that defendant utility had exercised due care in the operation of its dam and in maintenance of the level of the lake created by the dam. Defendant, as a matter of policy followed a rule curve to determine ideal lake elevations for each period of the year. Once excessive, unpredicted rains caused the lake level to reach the maximum allowed by the Federal Power Commission, defendant was forced to open its spillways to equalize discharge and inflow. The court held that there would have been no difference in flooding of plaintiff's property had the dam not existed, that there was no duty of flood control imposed upon the defendant by law, and that the flooding was not unlawful 'taking' of plaintiff's property by the defendant. (Kelly-Fla)
W69-04665

LAWRENCE V BEHNCKE (INTERFERENCE WITH NATURAL WATER COURSE).

150 NYS 2d 494-496 (SC 1956).

Descriptors: *New York, *Natural flow doctrine, *Watercourses (Legal), *Obstruction to flow, Judicial decisions, Riparian rights, Water law, Relative rights, Downstream, Natural flow, Natural streams, Diversion, Alteration of flow, Stream flow, Damages, Legal aspects.
Identifiers: Proper parties.

Plaintiff acquired land downstream from defendant's land. Plaintiff brought this action for damages based upon alleged diversion and obstruction of a natural water course which flowed across lands of defendant and plaintiff. The complaint contained additional allegations to the effect that defendant changed the grade of his land so as to cast surface water upon plaintiff's lands. Defendant's acts of interference with the watercourse were alleged to have occurred before plaintiff acquired the land. Defendant filed motion to dismiss, contending that the owners at the time of the alleged acts were the only parties who could bring action. The court stated the owner of land through which a natural stream flows may not divert such stream or obstruct its flow if such action would injure upper or lower proprietors. The court held that when plaintiffs took title to the land, they obtained, as part and parcel thereof, the right to have the watercourse continue to flow in its natural channel even though it had been diverted from that channel prior to the time they obtained title. Such right could be lost only by grant or adverse possession. Thus, the allegations regarding the diversion and obstruction of a natural watercourse were held sufficient to state a cause of action, however, those facts stated regarding the changing of grade were insufficient to withstand defendant's motion to dismiss and were striken from the complaint. (Wheeler-Fla)
W69-04674

SEABOARD AIR LINE RAILROAD CO V SARASOTA-FRUITVILLE DRAINAGE DISTRICT (DRAINAGE WATER DAMAGES).

251 F 2d 583-590 (5th Cir 1958).

Descriptors: *Drainage districts, *Florida, *Right-of-way, *Contracts, State government judicial decisions, Legal aspects, Condemnation, Railroads, Canals, Drainage systems, Culverts, Ditches, Damages, Easements.

Plaintiff granted a canal right of way to the defendant so that it could place drainage installations under the plaintiff's railroad track. The defendant

is immune from tort liability under Florida law. Defendant, as part of the consideration for the right of way, agreed to indemnify plaintiff for any expenses it may incur as a result of the grant. Defendant was not obligated to agree to this because it has adequate condemnation authority. Plaintiff's train was derailed as a result of the lowering of the ditches adjacent to the undertrack culverts by defendant. Defendant contended that the agreement was not enforceable because it had no authority to bind itself as an indemnitor. The court held that plaintiff did have a cause of action because the defendant had authority under state law to obtain easements by purchase or exchange. It was not required to give cash as consideration for the rights. Here, defendants promise was the consideration and therefore the contract was binding. (Molica-Fla)
W69-04682

DAVIES V SHAFFER (OBSTRUCTION OF DRAINAGE DITCHES).
58 Lackawanna Jurist 73-76 (Cp Pa 1956).

Descriptors: *Pennsylvania, *Obstruction to flow, *Ditches, *Damages, Judicial decisions, Legal aspects, Pipes, Drainage systems, Water law, Diversion, Natural flow, Rainfall, Precipitation excess.
Identifiers: Trespass, Injunction (Prohibitory), Prescriptive easements.

Plaintiff brought action to restrain defendant from trespassing on plaintiff's property and to recover damages caused by such trespass. Defendant resided on property adjacent to and lower in elevation than plaintiff's property. From 1923 to 1937 there were natural drainage ditches flowing over plaintiff's land and into defendant's property. During 1937, a roadway was constructed between the tracts in question causing increased elevation therein. Galvanized pipes were inserted under the roadway to replace the natural drainage ditches. In 1955 before a torrential rain defendant entered plaintiff's property and clogged the drainage pipes with rocks and mud. During the subsequent rain, water accumulated and substantially eroded plaintiff's lawn and damaged his shrubbery. The court held that an owner of lower land is bound to receive water as it naturally flows from land of an upper owner. The continuous flow of water through the ditches for thirty years established a right of continuance. One who interferes with such right does so at his peril. Pipes inserted to replace natural drainage ditches, if adequate, do not change character of ditches, and arbitrary filling of such pipes constitutes, a nuisance. The court entered the injunctive order and ordered plaintiff his damages and costs. (Holt-Fla)
W69-04684

SMITH V WAGNER (ARTIFICIAL CONCENTRATION OF DRAINAGE ON NEIGHBOR'S LAND).

38 Westmoreland Law Journal 181-187 (Cp Pa 1956).

Descriptors: *Pennsylvania, *Drainage water, *Damages, *Diversion structures, Artificial watercourses, Judicial decision, Drainage effects, Drainage surface waters, Riddance (Legal aspects), Surface runoff, Controlled drainage, Natural flow, Obstruction to flow, Diversion, Legal aspects, Drains.

This case deals with alteration of the natural flow of water onto plaintiff's land. Defendants diverted the natural southwesterly drainage of water to a northerly direction by constructing a drain connecting with plaintiff's drain; both these drains flowed into the state highway drainage system. As a result of defendants' actions in filling its land, and because of its mode of collecting water, all the surface drainage was discharged on plaintiff's property in a concentrated stream. Foreign material was thereby deposited to a depth of over one foot a year on plaintiff's wall and up to one inch on the lawn in front of plaintiff's house. The plaintiff has sustained damages of $287.00 to alleviate this condition. The court found the defendants had wrongfully diverted the flow of surface water and were responsible for a continuing trespass on plaintiff's property. Defendant's were liable for the $287.00 damage already sustained by plaintiff and were ordered to install and maintain a catch basin, with sump, and additional drainage ditches to eliminate the problem. The principle of law relied on by the court was that landowner may not alter the natural flow of surface water on his property by concentrating it in an artificial channel so as to damage another property owner. (Heckerling-Fla)
W69-04685

BEATTY V FLAIL (ARTIFICIAL CHANNEL OF SURFACE WATER WASHED ONTO ADJOINING LAND).
43 Del Co 293-302 (C P Pa 1956).

Descriptors: *Judicial decisions, *Pennsylvania, *Discharge (Water), *Artificial watercourses, Channel flow, Pipe flow, Soil erosion, Developed waters, Surface drainage, Surface runoff, Diffused surface water, Drainage water, Riddance (Legal aspects), Storm runoff, Legal aspects, Storm drains, Conduits, Subsurface drainage, Sewers.

Defendant builders acquired a 35 acre tract of land which abutted plaintiff's 3 acre tract. Defendants subdivided the property into lots, developed the land, and built houses thereon. Storm sewers were also constructed by defendants, and these were connected to an 18 ft. pipe which emptied 80 feet from plaintiff's property. Surface waters concentrated by the pipe caused damage to the plaintiff's driveway and land. Plaintiff asked defendant to abate this nuisance, but defendants failed to do so. Plaintiff had his driveway hard-surfaced and had the black topping replaced because of water damage. Defendants, after commencement of the suit, had leeching wells constructed which corrected the situation. Plaintiff brought suit in equity to recover damages to their property. The court held that, even though the defendant secured a competent engineer and followed the rules, regulations, and directions of the township and county planning commission, defendants were guilty of a continuing trespass against plaintiff's property, until they constructed the leeching wells, and are liable for damages inflicted and for such costs as are necessary to enable plaintiff to correct the damage. The reasoning of the court was that 'a landowner may not alter the natural flow of surface water on his property by concentrating it in an artificial channel and discharging it upon the lower land of his neighbor even though no more water is thereby collected than would naturally have flowed upon the neighbor's land in a diffused condition.' (Heckerling-Fla)
W69-04686

A K ROY, INC V BOARD OF COMM'RS (EXTENT OF LEVEE DISTRICT APPROPRIATION POWER).
237 La 541, 111 So 2d 765-769 (1959).

Descriptors: *Louisiana, *Appropriation, *Lake beds, *Ownership of beds, Administrative agencies, Judicial decisions, Levees, Lakes, Overflow, Water control, Floodwater, Flood control, State governments, Lake shores, High water mark, Legislation, Prescriptive rights, Compensation, Mississippi River, Navigable waters.

Plaintiff, A K Roy, Inc, sued the defendant to recover the value of land bordering on Lake Pontchartrain appropriated by the defendant for levee purposes. The trial court awarded plaintiff $5,115. The main argument of the defendant on appeal was that the property in dispute formed a part of the bed or shore of Lake Pontchartrain. The court stated that it was immaterial whether the property was classified as sea shore, which belongs to no one and is insusceptible of private ownership, or as the bed of a navigable lake, ownership to which is in the state up to the high water mark, since in either event plaintiff would not be entitled to compensation. However, evidence as to the extent of plaintiff's property below the ordinary high water mark was insufficient for adjudication, and the case was remanded for further proceedings. (Patterson-Fla)
W69-04689

WATER FRONT IMPROVEMENTS.
Mich Comp Laws Ann secs 123.601-123.604 (1967).

Descriptors: *Docks, *Navigable waters, *Permits, *Financing, Michigan, Ships, Boats, Local governments, Legislation, Cities, City planning, Leases, Regulation.
Identifiers: *Public landings, *Commercial craft, *Waterfront, *Revenue bonds, Local agencies, Validating legislation, Fees.

Where any city in this state with water front bordering on navigable waters has provided for acquisition, improvement or repair of water front facilities, and for revenue bond financing, such acts are hereby validated. Where any city has provided boards or commission for operation and control of such facilities, they are validated and hereby empowered to license and charge fees to ferries and other commercial craft using public landing places. Such boards or commissions may also license the construction, operation and maintenance of such wharves, docks and piers, and make appropriate rules and regulations governing such operations. Any agreements entered into for leasing of landing facilities are hereby validated, and future revenue bond financing authorized. (Harris-Fla)
W69-04692

WATER-WORKS.

Mich Comp Laws Ann sec 106.1-106.11 (1967).

Descriptors: *Michigan, *Legislation, *Water works, *Cities, Water distribution, Water rates, Water supply, Utilities, Public utilities, City planning, Ordinances, Construction, Eminent domain, Condemnation, Financing, Costs, Water law, Legal aspects.

This statute authorizes certain cities to construct and maintain water works. Any such city may purchase or erect any structure, and may acquire any land necessary for this purpose. The city may float a bond issue to finance such purchases and construction. The city electors shall vote on the question of raising the amount required for construction, but the city council shall have the authority to expend funds for maintenance following construction. Private connections shall be inserted and maintained at the landowner's expense. The board of public works shall annually establish water rates for each class of building using water. The city council may enact ordinances for the care and control of the water works. If the water works is located beyond the corporative limits of the city, the council shall have the same control as if it were in the city. The city may lay necessary pipes and aqueducts to extend any system, and it shall have the power of condemnation in carrying out this act. Any city may contract with any person or corporation for supply of water to such city. (Helwig-Fla)
W69-04693

4B. Groundwater Management

SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
Geological Survey, Washington, D. C.
C. L. McGuinness.
Geol Surv Circ 608, 1969. 8 p, 16 ref.

Descriptors: *Water management (Applied), *Groundwater, Artificial recharge, Conjunctive use, Non-structural alternatives, Water demand,

Water utilization, Water supply, Water wells, Groundwater basins.
Identifiers: Water resources management, Groundwater management.

Emphasis in groundwater development, once directed largely to quantitatively minor (but sociologically vital) service of human and stock needs, is shifting: aquifers are treated as possible regulating reservoirs managed conjunctively with surface water. Emphasis on reducing stream pollution is stimulating interest in aquifers as possible waste-storage media. Such management of aquifers requires more data and a much better understanding of aquifer-system behavior than now exists. Implicit in this deficiency of knowledge is a danger that aquifers may be managed according to ineffective rule-of-thumb standards, or even abandoned as unmanageable. The geohydrologist's task is to define both internal and boundary characteristics of aquifer systems. Stratigraphy is a primary determinant of these characteristics, but aquifers often transcend stratigraphic boundaries. Hence, there is a need for aquifer studies that are very different from ordinary stratigraphic techniques. Among critical needs are techniques for measuring crossbed permeability, for using point data on direction and magnitude of permeability in defining aquifer geometry, and for using geochemical methods in studies of source of water, rate of movement, and waste-sorbing capacities of rocks. In general, these are techniques adequate for predicting aquifer response to imposed forces. Only when such predictions can be made routinely can aquifer characteristics be inserted into a master model that incorporates both the hydrologic and the socioeconomic facts necessary to intelligent social actions involving water (Knapp-USGS)
W69-04231

HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 03D.
W69-04267

COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
Illinois State Water Survey, Urbana.
Roger L. Thomas.
Ill State Water Surv Rep of Invest No 60, 1968. 23 p, 15 fig, 16 tab, 11 ref.

Descriptors: *Artificial recharge, *Pit recharge, *Filters, Sands, Gravels, Particle size, Particle shape, Illinois.
Identifiers: Recharge rate, Peoria (Ill).

Experiments were made on filter bed performance and its relation to grain size of the filter media to explain the performance of filters used in artificial recharge at Peoria, Illinois. In 1951 a pit was put into operation with a 6 in. sand filter layer, and was used for 3 yr. Because of clogging problems, coarse-grained filter medium was used from the 4th year to the present. A second pit was built in 1956, and the two have operated simultaneously since then. with use of 3/8-in. pea gravel, clogging of the filter layer was reduced. Between 1951 and 1965, total recharge was over 8.5 billion gal with 3.795 through Pit 1 and 4.717 through Pit 2. However, the advantages of higher recharge rates through the coarse filter media were lost because of clogging in the underlying aquifer. In the laboratory experiments, Illinois River water was applied to 4-in. lucite filter columns containing various sizes and depths of coarse filter media and aquifer materials. Water analyses were made primarily for suspended solids and turbidity. Recharge rate, coarse medium size, and coarse medium depth were all found to be related to particle removal efficiency. The relationships can be expressed by the equation: % Removal of suspended solids=-34.5 + 29.8 log D-44.0 log d-35.2 10g R where D = depth, d = diameter of particles, and R = recharge rate. Very little change in recharge water chemical quality was caused by passage through coarse filter media. The depth of silt penetration into the aquifer appeared to be a function of recharge rate, although most of the particles which passed through the filter media were retained in the upper part of the aquifer. (Knapp-USGS)
W69-04563

4C. Effects on Water of Man's Non-Water Activities

MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W69-04269

FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).

248 A 2d 106-117 (Md Ct App 1968).

Descriptors: *Maryland, *Percolating water, *Sinks, *Land subsidence, Judicial decisions, Subsurface waters, Ground water, Water law, Capillary conductivity, Pit recharge, Seepage, Voids, Quarries, Excavation, Pumping, Reasonable use, Damages, Legal aspects.
Identifiers: Negligence.

Plaintiffs owned a farm adjacent to defendant's property. Defendant operated a stone quarry on its land which contained a large quarry pit. It was necessary for defendant to keep its excavation dry by continually pumping out the water which accumulated in its quarry. This pumping caused the velocity of the ground water flowing toward the quarry to increase, which resulted in the formation of earth cavities, and in the eventual surface collapse of a part of plaintiff's land. Plaintiff brought suit for damages. Plaintiff did not contend there was interference with any flow of water in defined courses, nor did he contend defendant acted negligently. The trial court directed a verdict for defendant. The appellate court affirmed, ruling that the waters in question must be assumed to be percolating waters. The court held that since there was no showing of negligence in the excavation of the quarry, or of any waste, malice or sale of percolating waters, or other unreasonable use, defendant was not liable for the resulting damages. (Wheeler-Fla)
W69-04371

STORMWATER SEWERS FOR COUNTY ROADS; MUNICIPAL COOPERATION.

N J Stat Ann secs 27:16-24 (1966).

Descriptors: *New Jersey, *Drainage systems, *Roads, Storm drains, Legislation, Local governments, Cities, Sewers, Legal aspects, Maintenance.

The board of chosen freeholders may direct the construction of a storm water drainage system in connection with the improvement or maintenance of a county road. The act provides the procedures to be followed in accomplishing such construction. (Childs-Fla)
W69-04418

HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
Geological Survey, Washington, D. C.
Luna B. Leopold.
Geol Surv Circ 554, 1968. 18 p, 8 fig, 1 tab, 28 ref.

Descriptors: *Urbanization, *Hydrologic aspects, Hydrographs, Hydrograph analysis, Storage, Sediment yield, Water temperature, Water pollution.
Identifiers: Urban hydrology.

The effects of urbanization on hyrologic factors are discussed and rainfall-runoff relations of urbanized and unurbanized watersheds are compared. Urbanization increases the amount of impervious area in a watershed so that the intensity and amount of runoff increase and peak discharges occur sooner. Sediment yields are 10-100 times larger in urbanized watersheds, water quality decreases, water temperature generally increases, and esthetic values usually decrease. Hydrographs, frequency curves, and sediment yield-discharge curves, are used to show typical effects of urbanization on streams. (Knapp-USGS)
W69-04548

EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
American Society of Civil Engineers, New York.
H. F. Smith.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6355, pp 287-309, Jan 1969. 23 p, 2 append.

Descriptors: *Bibliographies, *Urbanization, *Hydrology, Information retrieval, Discharge (Water), Floods, Hydraulics, Runoff, Surface runoff, Streamflow.
Identifiers: *Urban hydrology bibliography.

This Progress Report by the Task Force on Effect of Urban Development on Flood Discharges, Committee on Flood Control, Hydraulics Division, ASCE attempts to provide, as a guide for engineers, planners, governmental officials, and all others interested in the problems of urban runoff, an annotated up-to-date bibliography of reports, papers, and other material pertaining to the effect of urban development on flood discharges. The report includes a brief discussion of the impact on flood runoff which can be expected by urban development and the factors directly affecting the runoff regimen of a drainage area, as suburbs and cities replace the rural landscape. Included is a listing of pertinent research projects which are underway with identification of areas where, in the opinion of the Task Force, additional research is required. (Knapp-USGS)
W69-04560

THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 02F.
W69-04621

EFFECT OF A COMMERCIAL CLEAR-CUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
Forest Service (USDA) Upper Darby, Pa. Northeastern Forest Experiment Station.
Kenneth G. Reinhart.
J. Forest. 1964, 62 (3): 167-171.

Descriptors: *Rainfall-runoff relationships, Watersheds (Basins), Deciduous forests, Overland flow, *Watershed management, Storm runoff, West Virginia, Infiltration, Hydrologic aspects.
Identifiers: *Timber harvest, *Logging (Forest), Experimental watersheds.

A commercial clearcutting was made on a 74-acre gaged watershed on the Fernow Experimental Forest; skidroads were loggers' choice--without limitations as to grade or provisions for drainage. After-logging infiltration rates in the watershed remained well above maximum rainfall intensities except on portions of the skidroads. Overland flow occurred only from the skidroads; it resulted from the combination of rain directly on the skidroads and interception of subsurface flow by the road cuts. Increased storm runoff in the growing seasons--up to a maximum of about 1/2 area-inch in any one storm--was largely the result of decreases in field-moisture deficiency rather than changes in the proportions of surface and subsurface flow. This study indicates that, in judging

hydrologic condition of logged areas, perhaps as much emphasis should be placed upon road conditions and forest-floor disturbance as upon the amount of timber cut and condition of the stand. (Reinhart-USFS)
W69-04632

KERHONKSON LODGE INC V STATE OF NEW YORK (ACTION FOR DAMAGE FROM SURFACE WATER DISCHARGE).

4 App Div 2d 575, 168 N Y S 2d 56-59 (S Ct 1957).

Descriptors: *New York, *Surface waters, *Drainage systems, *Washouts, Judicial decisions, Ditches, Surface runoff, Highways, Damages, Floods, Water law, Drainage, Erosion, Drainage engineering, Cloudbursts, Flood damage. Slopes, Legal aspects.

Plaintiff owned hotel property situated on both sides of a state highway. At the time of the highway's construction, a culvert was placed under the road which discharged surface water onto one tract of plaintiff's land, and a drainage ditch, leading to the culvert, was placed along the opposite side of the road. The State later made changes in this drainage system, subsequently heavy rains caused erosion and flood damage to plaintiff's land. Plaintiff brought action for damages, alleging that the changes made by the State were the actual and proximate cause of damage. At trial, plaintiff introduced evidence tending to support these allegations. The lower court dismissed the claim on grounds that the changes were in accord with good engineering practice. The appellate court reversed, and directed a new trial. The court held that the correct issue was whether the changes increased the flow of surface water onto plaintiff's land by artificial means so as to cause the damage in question. The court also ruled that plaintiff was under no duty to keep a dry brook free from debris accumulated from surface waters discharged from the drainage ditches, which defendants contended was a contributing cause of the damages. (Wheeler-Fla)
W69-04673

GELLIS V TOWN OF HARRISON (INCREASED SURFACE RUNOFF).
159 NYS 2d 228-231 (S C 1956).

Descriptors: *New York, *Pipes, *Surface runoff, *Surface drainage, Boundaries (Property), Judicial decisions, Natural flow doctrine, Cities, Roads, Culverts, Drainage water, Legal aspects.
Identifiers: Trespass.

Plaintiff landowner sued the defendant, a municipality, alleging that the construction of a road, culvert, and catch basin by the defendant subjected plaintiff's property to increased flow of surface waters from areas that had not previously drained onto the property. The court found that there was insufficient evidence to support the plaintiff's claim. Plaintiff also repeatedly complained of the protrusion onto his property of a few feet of the pipe by which the allegedly offensive water was conveyed. Since the plaintiff did not ask for its removal in the complaint, however, the court did not order such removal, stating rather that plaintiff could remove it if he so desired. (Scott-Fla)
W69-04676

BATTISTO V PERKINS (ACTION FOR DAMAGE FROM INCREASED SURFACE WATER FLOW).

124 A 2d 288-292 (Ct App Md 1956).

Descriptors: *Maryland, *Natural flow, *Surface runoff, *Precipitation excess, Slopes, Judicial decisions, Surface waters, Water law, Relative rights, Surface drainage, Damages, Rain water, Mudflows, Artificial watercourses, Legal aspects.
Identifiers: Nuisance, Directed verdict.

Defendant owned property above the lands of plaintiff and proceeded to develop his land for residential purposes. Plaintiffs alleged that as a result of this regrading and tree removal the natural flow of water was accelerated and that mud and debris were repeatedly deposited upon plaintiff's properties, causing damages. Plaintiff brought an action for nuisance to recover damages. The trial court gave a directed verdict for defendants. On appeal, plaintiffs contended that the evidence presented raised a jury submissible issue as to whether defendants took reasonable precautions against injury under the circumstances. The appellate court agreed and granted a new trial. The court stated that Maryland cases make it clear that the upper landowner cannot artificially increase or concentrate the natural flow to the detriment of the lower owner and that this rule applied to urban as well as rural lands. (Wheeler-Fla)
W69-04680

4D. Watershed Protection

MUNICIPALITIES.

Me Rev Stat Ann tit 30, sec 3553 (1965).

Descriptors: *Legislation, *Maine, *Cities, *Navigation, Erosion control, Easement, Condemnation, Project purposes, Federal project policy, Contracts, State governments, Local governments, Cost sharing, Eminent domain, Flood damage.

The statute deals with municipal assistance in the improvement of navigation and the prevention of erosion. It authorizes a municipality to acquire real estate or easements by condemnation for town ways. The provision also allows the municipality to contract with the state and federal government to comply with requirements imposed by the federal government regarding any government-approved project for improving navigation or preventing erosion and floods. The statute provides that two or more municipalities may act jointly in performing the operations. The governor has power to designate a state agency to make any investigation considered necessary. (Stewart-Fla)
W69-04380

LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
295 N Y S 2d 268-276 (Sup Ct 1968).

Descriptors: *New York, *Beach erosion, *Islands, *Transportation, Judicial decisions, Legal aspects, Beaches, Shores, Cities, Legislation, Easements, Highways.
Identifiers: Police power.

Plaintiffs brought an action to have the defendant's vehicle ordinance, which restricted the use of vehicles on the inland and beach routes of an adjoining island, declared unconstitutional. The ordinance was passed in an effort to curtail erosion on the island caused by vehicular traffic. The court held that the ordinance was constitutional as a proper exercise of the police power of the state, since it was aimed at insuring the safety of the inhabitants of the island. Plaintiff did not have a prescriptive easement in the inland routes since their use was not hostile or adverse to the inhabitants, who occasionally erected homes directly in the middle of the routes. Plaintiffs had no easement to use the beach route since it is property affected with a public interest and is therefore not subject to easements. The inland routes are not public highways because defendant never undertook to maintain them. The beach route is not a public highway because the legislature does not intend beaches to be open to the use of the public for purposes of vehicular travel. The ordinance did not constitute a taking of property without due process of law. (Molica-Fla)
W69-04389

CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
Department of Agriculture, Washington, D. C.
Austin B. Smith.
In PROCEEDINGS OF THE INTER-AGENCY SEDIMENTATION CONFERENCE, 1963, Miscellaneous Publication No 970, June, 1965, pp 618-626.

Descriptors: *Sedimentation, *Dredging, *Mississippi River, *Louisiana, Coastal plains, Geographical regions, Gulf coastal plain, Regions, Southeast U. S., Channels, Jetties, Structures, Hydraulic structures, Engineering structures, Embankments, Sediment transport, Bodies of water, Interstate rivers, Rivers, Running waters, Streams, Surface waters, Navigable waters, Dikes, Channel improvement, Earthworks.

Sedimentation has always been a major navigational problem at the Mississippi River passes. This is being constantly remedied by construction of retention dikes, jetties, and channelization. The quantity of sediment removed and some removal costs are indicated for certain river stretches. Sediment loads of 1,000,000 tons daily are brought to the Mississippi River mouth, extending the channel profile 100 feet per year. It is anticipated that extensive maintenance dredging will be required in the new Mississippi Gulf Outlet.
W69-04501

CITY OF TREASURE ISLAND V STRONG (ASSESSMENTS FOR EROSION CONTROL GROIN SYSTEM).
215 So 2d 473-479 (Fla 1968).

Descriptors: *Florida, *Erosion control, *Beach erosion, *Assessments, Judicial decisions, Legal aspects, Gulf of Mexico, Legislation, Estimated benefits, Taxes, Land tenure, Financing, Cost allocation, Cost-benefit theory, Cost-benefit ratio, Cost-benefit analysis.
Identifiers: City of Treasure Island, Waiver.

City ordered issuance of $350,000 in revenue certificates to finance a beach erosion control groin system. Costs were to be born by abutting landowners and those in sufficient proximity to receive the benefits of the project. A hearing was held at which no objection was made. After construction was completed, the city brought suit to collect the assessments due from several landowners. The lower court declared the assessments void, but the Supreme Court reversed. The court recognized that special assessments should not exceed the benefits accruing to the properties assessed. Nevertheless, the landowners in this case had waived their right to object since no objections were raised at the hearing. The city's failure to determine special benefits to the property was not fatal. Special assessments are permitted without an express finding as to the benefits that will accrue. The burden is on those persons aggrieved by an alleged invalid assessment to raise timely objection thereto. (Shevin-Fla)
W69-04653

STATE BEACH EROSION COMMISSION.

N J Stat Ann secs 52:9J-1 to 52:9J-3 (1955).

Descriptors: *Legislation, *New Jersey, *Beach erosion, *Administrative agencies, State governments, Bulkheads, Beaches, Shores, Coastal structures, Shore protection, Seashores, Jetties, Legal aspects, Planning, Sea walls, Coastal engineering.
Identifiers: *Beach erosion commission.

Section 1 creates a permanent commission to study the subject of the protection and preservation of beaches and shore front of the State from erosion and other damage, to effectuate such protection and preservation of the beaches and shore fronts. Section 2 provides that the commission shall be called the State Beach Erosion Commission and

shall be composed of four members of the Senate appointed by the President of the Senate, four members of the General Assembly to be appointed by the Speaker, and four members at large appointed by the governor. Commissioners appointed by the governor shall serve four years, the other commissioners shall continue from the date of their appointment until the second Tuesday in January. The members shall serve without remuneration. Section 3 provides that the duties of the commission shall be to consider and provide ways and means to preserve the beaches and shore fronts by necessary means and devices. The committee shall take into consideration the advisability of repairing existing seawalls, bulkheads, jetties, basins, and other similar devices. (Heckerling-Fla)
W69-04698

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
Federal Water Pollution Control Administration, Washington, D. C. Div. of Pollution Surveillance.
D. G. Ballinger.
Water and Sewage Works, Reference No 1968, pp R38-R42, Nov 29, 1968. 5 p, 8 tab, 3 ref.

Descriptors: *Water quality, *Standards, Public health, Potable water, Water chemistry, Chemical analysis, Water pollution effects, Domestic water, Industrial water, Stock water, Municipal water.
Identifiers: Water quality criteria.

The water quality parameters which must be measured for most water uses are listed without specification of any quantitative criteria. The lists include an analysis of frequency of parameter usage by state authorities, parameters for public supply, metal determinations for public supply, chemical parameters for industrial water, chemical parameters for fish and wildlife, pesticides in marine waters, chemical parameters for agricultural (domestic) water, and industrial waste parameters. A large number of measurements must be used to evaluate water quality. Waste load analysis must include not only identification of undesirable constituents, but also measurement of impaired desirable constituents such as dissolved oxygen. The constituents to be determined are listed and references to sources of the applicable standards of concentrations of constituents are given. (Knapp-USGS)
W69-04222

THERMAL POLLUTION AND AQUATIC LIFE,
Bureau of Sport Fisheries and Wildlife, Highlands, N. J. Sandy Hook Marine Lab.
John R. Clark.
Sci Amer, Vol 220, No 3, pp 19-27, Mar 1969. 9 p, 7 illus, 4 photo.

Descriptors: *Thermal pollution, *Thermal properties, *Aquatic life, *Aquatic environment, Aquatic populations, Fish populations, Fish toxins, Fish physiology, Salmon, Bass, Trout, Nutrients, Water quality control, Water policy, Water pollution treatment, Water resources, Water management (Applied), Engineering structures, Plants.
Identifiers: Connecticut River, Monongahela River, Hudson River, Thermograms.

The author discusses in a popular manner the thermal pollution of rivers, lakes and estuaries and its effect on fish and other organisms present in these waters. On the basis of earlier contributions made by the Water Resources Division, U. S. Geological Survey, University of Toronto (F.E.J. Fry), the Yale University (G.E. Pickford), and others, color thermograms of the Connecticut, Monongahela, and Hudson Rivers are shown and the diagrams of fish acclimation and temperature preference are presented. The author states that there is a great variety of polluting factors; the effects of any one of these factors might be tolerable, but the cumulative and synergistic action of all of them seems likely to impoverish the water environment drastically. (Gabriel-USGS)
W69-04235

IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
Stanford Univ., Calif.
Claude Z. Maehler, and Arnold E. Greenberg.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 517-536.

Descriptors: *Oil wastes, *Pollutant identification, *Analytical techniques, *Gas chromatography, *Spectrophotometry, *Water analysis, Wastes identification, Organic matter, Wastes, Estuarine environment, Aquatic environment, Environments, Water quality, Analysis, Gases, Water pollution control, Control, Water pollution sources, Chromatography, Photometry, Water vapor.

The increased concern about spills of petroleum products in the estuarine environment has brought about increased demands for analytical methods of identifying pollutants and their sources. A number of qualitative comparative procedures have been described which establish the clear recognition of petroleum products in water. These procedures are capable of demonstrating characteristics of petroleum materials peculiar to individual lots, but analysis should generally include several of the techniques. They are therefore useful in comparing oil spills with reference samples. A simple sequential scheme is presented which includes gas chromatographic analysis of vapor space gas and solvent extraction followed by infrared spectrophotometric and paper chromatographic examinations.
W69-04282

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 02L.
W69-04291

THE HUDSON RIVER ESTUARY: HYDROLOGY, SEDIMENTS AND POLLUTION,
A. W. McCrone.
The Geographical Review, Vol 56, No 2, 1966, pp 175-189.

Descriptors: *Pollutant identification, *Sediments, *Radioactivity, *Hudson River, *Radioactivity effects, Chemical properties, Water properties, Aquatic life, Wildlife, Temperatures, Public health, Bodies of water, Rivers, Running waters, Streams, Animals, Aquatic animals, Cation exchange, Ion exchange, Separation techniques, Surface waters, Salinity, River beds, Streambeds, Beds, Fish, Water temperature, Hydrogen ion concentration.

A study was conducted of a 70-mile section of the Hudson River estuary from Kingston to Dobbs Ferry. The broad purpose was to observe hydrology and pollution and to obtain and analyze samples of river-bottom sediments from the Hudson estuary for radiological and associated geological and biological studies. The purpose was to identify the radioactive pollutants in the river and to determine the effect of their accumulation in the bottom muds and in organisms such as fish. Twenty-six sampling stations yielded 180 samples during the summer of 1964. Additional samples were taken from a severely polluted part of the river near Mechanicsville and from the Mohawk River near Crescent. Samples were taken of surface water, bottom water, and bottom mud. Readings were taken of salinity, temperature, and pH. Fathograms were recorded at key river cross sections. Bottom sediments were dried and analyzed for particle size and oxidizable organic matter. Minerals were identified microscopically, and cation exchange capacities and other chemical properties were determined. Radiation counts were made on sections taken of bottom core-samples. It was concluded that radioactivity concentrated in the Hudson River fish is insignificant in so far as public health is concerned.
W69-04480

EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
Wisconsin Univ., Madison. Dept. of Soil Science.
H. B. Pionke, J. G. Konrad, G. Chesters, and D. E. Armstrong.
Analyst, Vol 93, pp 363-367, June 1968. 2 tab, 8 ref.

Descriptors: *Analytical techniques, *Organophosphorus compounds, *Insecticides, *Lakes, *Pesticides, *Phosphorus compounds, *Water pollution identification, Halogenated pesticides, Gas chromatography, Pesticide residues, Sediments, Radiochemical analysis, Chlorinated hydrocarbon pesticides, Organic pesticides, Endrin, Aldrin, Diazinon, Heptachlor, Water pollution sources, Dieldrin, Wisconsin.
Identifiers: *Chlorine compounds, *Organochlorines, Gas-liquid chromatography, Liquid scintillation spectroscopy, Radioassay, Allequash Lake (Wis), Content Lake (Wis), Crystal Lake (Wis), Little Arbor Vitae Lake (Wis), Pickeral Lake (Wis), Plum Lake (Wis), Tomahawk Lake (Wis), Malathion, Gamma-BHC, Azinphos-methyl, pp'-TDE, pp'-DDT, Heptachlor epoxide, Methoxychlor, Parathion-methyl.

Methods for analysis of pesticide residues in natural waters require sensitivity, applicability to routine analysis, and reliable extractability of pesticide. Authors describe a method, by gas-liquid chromatography, for microgram/liter concentrations of nine organochlorine and four organophosphate insecticides after benzene extraction. By radioassay with liquid scintillation spectrometer they evaluated extraction efficiencies for radioactively labelled insecticides added to distilled water and to seven lake waters (selected on basis of diversity of sediments). Mean recoveries for compounds (in parentheses: concentrations added in micrograms/liter) were: gamma-BHC (1.23), 96.7%; heptachlor (1.60), 84.6%; aldrin (2.08), 101.8%; heptachlor epoxide (3.28), 97.4%; dieldrin (3.98), 98.7%; endrin (5.02), 98.4%; pp'-TDE (6.40), 97.3%; pp'-DDT (8.90), 96.1%; methoxychlor (32.5), 97.3%; parathion methyl (gas chromatographic determination) (38), 95.3%; diazinon (40), 98.4%; malathion (50), 99.7%; azinphosmethyl (66), 99.5%. Average difference between duplicates determined at different times, an estimate of errors associated with extraction and analysis, has range, 0.7 (pp'-DDT) - 2.9 (heptachlor). Standard deviation, indicating reliability between lake-water samples, has range, 0.60 (gamma-BHC) - 2.60 (heptachlor). Although reproducible, low heptachlor recoveries (81.0-88.0%) probably evidence its degradation in aqueous systems. Method can be easily modified, authors believe, to blanket sensitivity range for determination of organochlorines in most natural waters. (Eichhorn-Wis)
W69-04523

5B. Sources of Pollution

WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
Federal Water Pollution Control Administration, Chicago, Ill.; and New York State Dept. of Health, Albany.

Fed Water Pollut Contr Admin, N Y Dep Health Rep, June 1968. 125 p, 19 fig, 8 plate, 15 tab, 12 ref.

Descriptors: *Water pollution, *Lake Ontario, *New York, *Eutrophication, Municipal wastes, Industrial wastes, Sewage, Water pollution control, Waste disposal, New York State Barge Canal, Streamflow, Dissolved oxygen, Water resources development.
Identifiers: Finger Lakes (NY), Lake Ontario Basin.

The water pollution problems of the U. S. waters of Lake Ontario, the St. Lawrence River, and their tributaries are summarized. Eutrophication is advanced in Lake Ontario and Oneida Lake; algae blooms and beach accumulations are serious every summer. Municipal and industrial discharge of inadequately treated wastes cause low dissolved oxygen levels in the Lower Genesee River, Oatka Creek, Honeoye Creek, Barge Canal, Upper Seneca River, Owasco Outlet, Skaneateles Creek, Black River, and Onondaga Lake. Industrial waste contamination is serious in the Upper Niagara River, Eighteen-mile Creek, Oataka Creek, Upper Seneca River, Oswego River, Onondaga Lake, Black River, Grass River, and St. Lawrence River. Bacterial contamination has closed beaches at Geneva, Rochester, and Ithaca. The Lake Ontario circulation and stratification patterns tend to hold nutrients in the inshore growing area and intensify algae blooms. New York's pure waters program should substantially solve many of the area's problems by 1972. Needs for further work in alleviating pollution are outlined and pollution control recommendations are listed. (Knapp-USGS)
W69-04223

CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
New York State Dept. of Health, Albany.
Heinz B. Russelmann.
Water and Sewage Works, Reference No 1968, pp R64-R70, Nov 29, 1968. 7 p, 2 tab, 15 ref.

Descriptors: *Water pollution sources, *Water treatment, Sludge disposal, Effluents, Water softening, Saline water, Chemical precipitation, Coagulation, Filtration, Flocculation.
Identifiers: Water treatment plant wastes.

Water treatment plants generate wastes which are often overlooked as sources of pollution. Substances removed from raw water in the course of treatment are often discharged into streams or on the surface in settling lagoons. Water treatment wastes comprise the organic mineral, or biological materials in solution or suspension in raw water, wastes from previous users who discharge into water supply streams, and chemicals added to raw water in treatment. These wastes may be toxic to wildlife, increase oxygen demand, or cause harmful and unsightly sludge deposits. Control of discharges and better ultimate disposal methods are recommended, either through legislation or by enlightened water processing plant management. Typical water treatment waste characteristics are tabulated. (Knapp-USGS)
W69-04227

PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
Maryland Univ., Solomons. Natural Resources Inst.; and Maryland Dept. of Natural Resources.
For primary bibliographic entry see Field 02L.
W69-04244

ILLINOIS GROUND WATER POLLUTION,
Illinois State Water Survey, Urbana.
William H. Walker.
J Amer Water Works Ass, Vol 61, No 1, pp 31-40, Jan 1969. 10 p, 10 fig, 16 ref.

Descriptors: *Water pollution, *Groundwater, *Illinois, Water wells, Water pollution control, Water pollution sources, Water pollution treatment, Farm wastes, Industrial wastes, Sewage.
Identifiers: Water well contamination, Groundwater pollution.

The groundwater pollution presently occurring in Illinois is discussed and precautionary measures to prevent more contamination in the future are described and recommended. Contamination hazard of consolidated and unconsolidated aquifers in the State is shown by maps which can be used to guide planning of locations of wells, oil wells, and garbage disposal sites. Hazards are highest in highly permeable glacial outwash and in outcropping cavernous carbonate rocks, and lowest in buried consolidated fine sandstones. Cross sections and maps show typical sources and paths of contamination in several discussed cases of groundwater pollution by hot water, organic wastes, and water of inferior chemical quality. (Knapp-USGS)
W69-04256

INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
J. M. Davidson, C. E. Rieck, and P. W. Santelmann.
Soil Sci Soc Amer Proc, Vol 32, No 5, pp 629-633, Sept-Oct 1968. 5 p, 6 fig, 21 ref.

Descriptors: *Herbicides, *Urea pesticides, *Path of pollutants, *Soil water movement, Diffusion, Chlorides, Ion transport, Porous media, Solubility, Adsorption, Biodegradation.
Identifiers: Herbicide transport, Fluometuron, Diuron water flux, Molecuar diffusion.

The rate at which 2 substituted urea herbicides move through a water-saturated glass bead and uniformly packed soil column depends upon the water flux or average pore velocity. A 200-ml slug of 0.01N calcium sulfate solution containing either fluometuron (3- (m-trifluoromethylphenyl)-1,1-dimethylurea) or diuron (3- (3,4-dichlorophenyl)-1,1-dimethylurea) was introduced at 1 end of a 30-cm long column at a specific flux and the herbicide displaced through a column with 0.01N calcium sulfate at the same water flux. Effluent samples collected every 5-ml show fluometuron and the chloride ion to mix in a similar manner at the 2 fluxes studied. Experimental and calculated effluent concentration distributions did not agree when fluometuron was retained by the porous material. Retention isotherms were linear for fluometuron in 250 micron glass beads and Norge loam with the soil retaining more material per weight than the glass beads. However, the experimental results show the herbicide, fluometuron, appearing in the effluent earlier than predicted by the selected model. It can be concluded that fluometuron was sufficiently influenced by water flux and pore geometry to necessitate a knowledge of these parameters before estimating the amount of herbicide movement through a soil. Also, 2 herbicides from the same chemical family were found to have distinctly different soil retention properties. (Knapp-USGS)
W69-04258

POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
Federal Water Pollution Control Administration, Washington, D. C.
For primary bibliographic entry see Field 05E.
W69-04272

USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
Stanford Univ., Calif.
John A. Lager, and George Tchobanoglous.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 384-422.

Descriptors: *California, *Mathematical models, *Waste assimilative capacity, *Hydraulic models, *Mathematical studies, *Model studies, *Waste dilution, Southwest U. S., Pacific coast region, Regions, Geographical regions, Biochemical oxygen demand, Dissolved oxygen, Oxygen demand, Bodies of water, Bays, Diffusion, Effluents, Mixing, Waste disposal, Dispersion, Degradation (Decomposition), Water pollution.

Studies are reported summarizing the use of a physical hydraulic model and a mathematical model for assessing the waste assimilative capacity of San Francisco Bay. Specific effects studied include initial mixing and dilution, waste dispersion, and decay of waste material in the estuary. The model studies were directed toward assessment of dissolved oxygen and BOD. It was concluded that the mathematical model yielded more reliable results than did the hydraulic model.
W69-04277

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
Stanford Univ., Calif.
Ernest R. Leffel.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 370-383.

Descriptors: *Waste assimilative capacity, *Dissolved oxygen, *Mathematical models, *Water pollution, *Foreign countries, Oxygen sag, Mathematical studies, Model studies, Rivers, Bodies of water, Running waters, Streams, Surface waters.

Sources of pollution in the Chao Phraya River at Bangkok, Thailand, are outlined. A mathematical model is presented for calculating dissolved oxygen relationships in the estuary. It is stated that pollution conditions in the Chao Phraya estuary do not conform to assumptions employed in the development of previous formulations of oxygen sag relationships.
W69-04279

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
Committee on Public Works (U. S. Senate).
Paul W. McKee.

Descriptors: *Thermal pollution, *Virginia, *Maryland, *Electric power industry, *Design, *Forecasting, *Water utilization, Engineering structures, Industrial plants, Structures, Control, Water pollution control, Water pollution, Industrial water, Water types, Industry, Sites, Bays, Efficiencies, Southeast U. S., Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Cooling water, Powerplants, Water requirements.

The Department of Water Resources has requested investigation of the following topics: (1) Projection of electric power needs, cooling needs, and cooling water requirements for Chesapeake Bay through year 2010. (2) Optimal locations for future power plants considering all water uses involved. (3) The best plant design and operation for all environmental protection. (4) A review of the water uses and an estimate of the effects on them by the discharge of heated water. (5) The benefit to other uses of water by proper development of energy sources.
W69-04293

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
For primary bibliographic entry see Field 06B.
W69-04303

OIL SPILL RELIEF SEEN SOON.

Oceanology International, Vol 2, No 6, September/October, 1967, p 20.

Descriptors: *Water pollution sources, *Oil industry, *Oil wastes, *Water pollution control, Oil

wastes, Industries, Organic matter, Wastes, Oil, Control.

This article discusses several oil polltuion sources and related means of combating oil spillage.
W69-04308

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
Stanford Univ., Calif.
G. T. Orlob, R. P. Shubinski, and K. D. Feigner.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967. pp 646-675.

Descriptors: *Mathematical models, *Water quality, *California, *Computer models, Mathematical studies, Model studies, Water quality control, Geographical regions, Pacific coast region, Regions, Hydrodynamics, Fluid mechanics.

This paper presents the theoretical and practical bases for the development of a mathematical model for digital computer simulation of quality changes, concentrating on the distribution in space and time of conservative constituents. It carries forward from an initial study aimed at providing the means for characterizing estuarial hydrodynamic behavior and utilizes a digital model of an estuarial network which was developed and verified for the Sacramento-San Joaquin Delta. This model was extended in a subsequent study for the Federal Water Pollution Control Administration as a part of its comprehensive investigation of the San Joaquin Master Drain and its effects on water quality in San Francisco Bay and the Delta. It formed the basic building block for the quality model reported in this paper.
W69-04311

POLICING THE OIL INDUSTRY.
Oceanology International, Vol 2, No 3, May/June, 1967, p 11.

Descriptors: *Oil industry, *Water pollution sources, Oil, Industries, Oil wastes, Organic matter, Wastes.

The article discusses various conflicts between the petroleum industry and other interests.
W69-04318

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
Stanford Univ., Calif.
Harry McK. Roper, Jr.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 423-440.

Descriptors: *Hydraulic models, *Water pollution, *Bays, *California, Model studies, Bodies of water, Geographical regions, Pacific coast region, Regions, Southwest U. S., Deltas.

The use of a physical hydraulic model developed by the Corps of Engineers for studying pollution in San Francisco Bay is discussed. The model is constructed to a horizontal scale of 1:1,000 and a vertical scale of 1:100 and occupies an area of about two acres.
W69-04329

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
Wilbur N. Torpey.
Water Pollution Control Federation, Journal, Vol 39, No 11, November, 1967, pp 1797-1809.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Sewage, *Water pollution, *Harbors, *New York, *Foreign countries, Ecology, Oxygen demand, Wastes, Organic matter, Appalachian Mountain region, Geographical regions, Great Lakes region, Northwest U. S., Regions, Water quality, Waste treatment.

The author presents an historical analysis of the relationship between BOD loading and dissolved oxygen content of the waters in New York Harbor and the Thames Estuary in England. The findings appear to have important implications for estuarine management. The principal conclusion was that, for both of these estuaries, '...the curve defining the relationship of organic loading rate to dissolved oxygen is considerably distorted. It does not follow the smooth path of the oxygen-sag formulations.' An unexpected finding leading to the general conclusion was that for New York Harbor '...between 1916 and 1937 the rate of application of organic load to the harbor waters more than doubled, yet the DO concentration remained substantially unchanged. After 1937, the load on the harbor was relieved greatly by the successive installation of facilities providing secondary treatment for the wastes of about four million people, yet an improvement of only five percent in the oxygen saturation was realized. Apparently, a plateau approximating 43 percent oxygen saturation exists when the organic load applied to New York Harbor water lies in the range of 3,500,000-8,000,000 people. The loading increase by 4,500,000 people and subsequent decrease by 3,000,000 was not reflected in the DO content of the waters. This behavior was, to say the least, unexpected.' The author summarizes his findings as follows: 'Under light pollutional loading the ecology is composed of higher forms of biological life such as crustacea, mollusks, and fish. When the loading increases to a rate requiring about 20 lb. oxygen/day/acre (22 kg/day/ha) instability develops, the oxygen level drops sharply, and the fish migrate. When the waters receive loading rates that require 20-132 lb/day/acre (22-148 kg/day/ha) the DO remains substantially constant for the subject 30-ft- (9-m-) deep estuaries, at between 25 and 50 percent of saturation. This zone of the DO plateau is homeostatic in nature because the symbiotic activities of algae and bacteria are able, with an assist from the atmosphere, to supply enough oxygen to accommodate load variations. However, when the loading rate exceeds an upper threshold, wherein more than about 132 lb oxygen/day/acre (148 kg/day/ha) was required, the oxygen was exhausted and anaerobic conditions ensued.'
W69-04351

SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
124 A 2d 189-194 (N H 1956).

Descriptors: *New Hampshire, *Municipal wastes, *Public health, *Water pollution control, Legislation, Sewage bacteria, Pollutants, Water pollution, Sewage treatment, Backwater, Administrative agencies, Legal aspects, Judicial decisions, Rivers, Swimming, Public utilities.
Identifiers: Constitutionality, Police power.

The State Water Pollution Commission ordered a town to desist from discharging untreated sewage and wastes into a river. The river flowed into certain lakes and ponds created by a dam built and maintained by a utility company. The waters had been used for some time for public bathing. The order in question was issued subsequent to the Commission's findings that the waters were being polluted by the town and that a public health hazard was being created. Upon the commission's recommendation, the Legislature provided that these particular waters should be made acceptable for bathing. The order was issued to enforce the law. Town taxpayers brought suit for declaratory judgment and injunction to restrain the enforcement of the order. Plaintiffs contended the legislation was unconstitutional, as being unreasonable, arbitrary, and for the benefit of a limited class of persons, and that the commission's order was, therefore, invalid. The court affirmed the order, ruling that the public interest to which the statute was directed was not so clearly of minor importance as to make the action of the legislature in enacting it patently unreasonable. (Wheeler-Fla)
W69-04366

RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).

163 SE 2d 462-464 (SC 1968).

Descriptors: *South Carolina, *Water pollution, *Damages, *Industrial wastes, Legal aspects, Streams, Water pollution sources, Sewage, Water law, Judicial decisions.
Identifiers: Joinder of parties, Joint tort feasors, Collateral estoppel, Res judicata, Burden of proof.

Defendant City of Greenville acquired upper riparian land for use as an industrial park and leased a parcel to LTV, Inc. Defendant dumped the discharge of its sewage disposal plant and LTV discharged industrial wastes into Huff Creek, which flowed by and through plaintiff's land. Plaintiff received a judgment for damages against LTV in a prior action. Subsequently, plaintiff brought an action against defendant city to recover damages caused from pollution of the creek. The defendant claimed the prior judgment against LTV was a bar to plaintiff's suit because it involved substantially the same facts as those relied upon against defendant. The court held that plaintiff, who had the burden of proving damages, had failed to prove that any damages caused by defendant resulted from consequences other than those caused by LTV. The court relied on the maxim that 'one cannot actually recover twice for the same damage'. A judgment of nonsuit was therefore entered. (Holt-Fla)
W69-04372

THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.

N Y Pub Health Law sec 1150 (McKinney 1954).

Descriptors: *New York, *Discharge, *Pollution, *Wastes, Legislation, Sewage, Effluents, Administrative agencies, Administrative regulation, Industrial wastes, Public health, Cities, Legal aspects.

The discharge of sewage or other matter injurious to the public health is prohibited, unless express permission has been given for such discharge. The discharge of sewage by a municipally owned public sewer system or the discharge of refuse or waste from any industrial establishment in operation in 1903 is not prevented. (Childs-Fla)
W69-04391

SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,
C. A. Barnes, and E. E. Collias.
Journal of Marine Research, Vol 17, No 1, November 28, 1958, pp 68-80.

Descriptors: *Dissolved oxygen, *Washington, *Oxygen, Geographical regions, Pacific coast region, Pacific northwest U. S., Regions, Biochemical oxygen demand, Oxygen demand.

The changes of local oxygen concentration with time have been determined for selected basin waters in the Puget Sound system. In the photic zone of the sea, the oxygen concentration tends to be altered by local production, diffusion and advection, exchange of oxygen across the sea surface, and biochemical utilization. The average rate of oxygen utilization was 0.016 ml per liter per day, which is higher in comparison to offshore waters. Oxygen utilization rates decreased with both decreases in DO and increases in the time that the water had been standing in the basin. Some published work on Dabob Bay has also been discussed.
W69-04439

DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
Norman H. Brooks.
In PROCEEDINGS OF THE FIRST INTERNATIONAL CONFERENCE ON WASTE DISPOSAL IN THE MARINE ENVIRONMENT, July 22-25, 1959, pp 246-265. Pergamon Press, New York.

Descriptors: *Diffusion, *Waste dilution, *Sewage disposal, *California, *Ocean currents, Outlets, Design, Coliforms, Currents (Water), Municipal wastes, Geographical regions, Pacific coast region, Mathematical studies, Model studies, Southwest U. S., Regions, Bacteria, Microorganisms, Plants, Waste disposal, Water pollution sources, Sewage effluents, Bodies of water, Surface waters, Mathematical models.

Lateral mixing of sewage field in an ocean current has been analyzed, taking into account the increase of the eddy diffusivity as the field spreads. The exact solution of the partial differential equation balancing diffusion, advection, and mortality of coliform bacteria was derived, giving concentration as a function of the position in the horizontal plane downstream from the ideal line source. Simpler expressions were also obtained for the rate of spread of a sewage field and for concentrations along the centerline of the field downstream from the source. The application of these results to ocean outfall problems is explained by means of an outline of general design steps for outfall design and an example taken from an outfall plan recently prepared for the City of San Diego, California.
W69-04452

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, to december, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
Robert L. Cory, and John W. Nauman.
U. S. Geological Survey, Washington, D. C., Open-File Report, 1967.

Descriptors: *Maryland, *Water temperature, *Thermal pollution, *Powerplants, *Physical properties, *Rivers, Atlantic coastal plain, Appalachian Mountain region, Salinity, Dissolved oxygen, Turbidity, Tides, Engineering structures, Industrial plants, Structures, Cooling water, Water types, Surface waters, Regions, Northeast U. S., Geographical regions, Coastal plains, Temperature, Water properties, Water quality, Winds, Chemical properties, Density, Bodies of water, Running waters, Streams.

Graphs and tables obtained from continuous records of surface-water temperature from five stations for the period July, 1963, through December, 1965, and of surface, salinity, dissolved oxygen, turbidity, tide-stage, wind data, and bottom temperature from a single station are presented herein. Effects of power plant cooling water on water temperature were obvious at a station near the plant's discharge point. Surface-water density at the Patuxent River Bridge varied from 1.0033 to 1.0127 with least change during the period May to September. Salinity ranged from 3 to 16.5 parts per thousand. Average salinity in the spring of 1965 was double that of spring 1964. Turbidity was high during the winter, and peak values were obtained during prolonged periods of high wind velocities. Dissolved oxygen values ranged from 3.6 to 15.0 parts per million, and percentage saturation of oxygen from 49 to 144 percent. The extreme tidal range was 5.7 feet; mean water levels were highest in summer and lowest in winter and spring.
W69-04462

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
A. L. H. Gameson, M. J. Barrett, and W. S. Preddy.

International Journal of Air and Water Pollution, Vol 9, No 10, October, 1965, pp 655-664.

Descriptors: *Waste assimilative capacity, *Thermal pollution, *Mathematical models, *Foreign countries, *Forecasting, *Organic wastes, Mathematical studies, Model studies, Water pollution, Geographical regions, Regions, Dissolved oxygen, Nitrogen compounds, Water temperature, Temperature, Water properties, Wastes.

This paper discusses the salient features of a comprehensive study of the waste assimilation capacity of the Thames Estuary and two other estuaries in England. Field observations are compared with conditions predicted by a mathematical model. Thermal and organic pollution are considered. Extremely good correlation is noted for dissolved oxygen. Reasonably good correlation was also reported for the other parameters which were inorganic nitrogen, oxidized nitrogen, ammonical nitrogen, and temperature.
W69-04469

WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
For primary bibliographic entry see Field 05G.
W69-04516

INFRARED IMAGING FOR WATER RESOURCES STUDIES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and HRB-Singer, Inc., State College, Pa.
For primary bibliographic entry see Field 07B.
W69-04556

DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W69-04559

NITRIFICATION: IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
Dartmouth Coll., Hanover, N. H. Dept. of Biological Sciences; Dartmouth Coll., Hanover, N. H., Dept. of Earth Sciences; and Yale Univ., New Haven, Conn. School of Forestry.
For primary bibliographic entry see Field 02K.
W69-04584

BLUE V CHARLES F HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).

215 So 2d 426-429 (Miss 1968).

Descriptors: *Mississippi, *Oil wastes, *Land use, *Water pollution, Judicial decisions, Legal aspects, Land, Damages, Oil fields, Oil wells, Natural resources, Overflow, Reasonable use.
Identifiers: *Slush pits, Trespass, Nuisance.

Plaintiff owned certain lands in an oil field, and the defendant owned the oil. A well was drilled by defendant necessitating the establishment of a slush pit. Defendant then abandoned the well, leaving the pit full of contaminating matter. The pit enbankment broke, and the refuse flowed over plaintiff's land, contaminating a pond and doing considerable damage. The plaintiff sued defendant for property damages. The defendant claimed that adjacent landowners had no basis for a cause of action. It was contended that each landowner is privileged to use his land for development of natural resources and any injuries thereby caused are not actionable. The court held that when one makes unreasonable use of his property he should be liable for damages or subject to an action to abate such use. It is recognized that the operator of an oil well is liable for damages caused by oil, salt water, or the like flowing from wells onto adjoining lands or streams. This was a direct infringement of the plaintiff's property rights and is properly classed as a trespass. An oil drilling company which permits waste to flow onto another's land is liable on a nuisance theory as well as trespass. (Shevin-Fla)
W69-04654

5C. Effects of Pollution

WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
Federal Water Pollution Control Administration, Chicago, Ill.; and New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 05B.
W69-04223

THERMAL POLLUTION AND AQUATIC LIFE,
Bureau of Sport Fisheries and Wildlife, Highlands, N. J. Sandy Hook Marine Lab.
For primary bibliographic entry see Field 05A.
W69-04235

PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
Maryland Univ., Solomons. Natural Resources Inst.; and Maryland Dept. of Natural Resources.
For primary bibliographic entry see Field 02L.
W69-04244

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois State Water Survey, Peoria; and Illinois Univ., Urbana. Water Resources Center.
V. Kothandaraman, and Ben B. Ewing.
Supported in part by funds from OWRR, Dept of Interior. J Water Pollut Contr Federation, Vol 41, No 2, pp R73-R90, Feb 1969. 18 p, 17 fig, 4 tab, 24 ref.

Descriptors: *Water pollution, *Dissolved oxygen, *Statistical methods, Streams, Biochemical oxygen demand, Mathematical models, Monte Carlo method, Ohio River, Aeration, Reaeration, Oxygen sag.
Identifiers: Streeter-Phelps equation.

Because of the wide deviation in oxygen deficit values as predicted by the Streeter-Phelps equation, a study was initiated to predict DO deficits in a stream with known initial conditions. A hypothetical stream situation is used to consider the variations in deoxygenation and reaeration rate coefficients for predicting dissolved oxygen deficits. Statistical models are formulated and tested, and simulation techniques using the Monte Carlo method are employed in predicting the probabilistic variation in DO deficits for known initial conditions. The predicted results using the probabilistic model are found to agree with the observed values within practical limits and give more consistent results than the conventional methods. (Knapp-USGS)
W69-04247

ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
Tampa-Hillsborough Bay Technical Assistance Project, Tampa, Fla.; and Federal Water Pollution Control Administration, Washington, D. C., Office of Estuarine Studies.
James H. Finger, and T. Allen Wastler.
J Water Pollut Contr Federation, Vol 41, No 2, pp R101-109, Feb 1969. 9 p, 5 fig, 1 tab, 7 ref.

Descriptors: *Sludge, *Industrial wastes, *Municipal wastes, Oxygen sag, Biochemical oxygen demand, Nitrification, Oxygen demand, Sewage, Solid wastes, Pulp wastes, South Carolina.
Identifiers: Carbon-nitrogen ratios, Charleston Harbor (S C).

The observed ratios of organic carbon-organic nitrogen in natural environments are used to dif-

ferentiate between sludge deposits of industrial waste origin and those from human wastes. Field results from Charleston Harbor show deposits of both types in separate areas and mixtures of sludge deposits in some locations in the harbor. The C:N ration of domestic wastewater deposits is approximately 10, while that in deposits from untreated paper mill waste is 40. (Knapp-USGS)
W69-04248

NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
Stanford Univ., Calif.
James B. Lackey.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 188-217.

Descriptors: *Nutrients, *Marine microorganisms, *Pollutants, Recreation, Water sports, Environment, Aquatic environment, Estuarine environment, Water quality, Sewage bacteria, Environmental effects, Aquatic life, Aquatic microorganisms, Microorganisms, Seston, Invertebrates, Shellfish, Waste disposal, Sewage disposal, Water chemistry, Ecology, Water pollution, Water pollution control, Control, Algae, Plants, Commercial fishing, Fishing, Industries, Commercial shellfishing, Animals, Aquatic animals.

The behavior of microbiota--algae and protozoa--as affected by commercial, recreational, and metropolitan uses of estuarine waters are outlined. Some of the findings presented at the symposium are as follows: (1) Estuaries and bays are of great economic and recreational value, for nurseries, fishing grounds, shellfisheries, crustacean production, boating, and bathing. (2) Human activity often modifies their preferred ecology by adding nutrients or pollutants. (3) The suspended (plankton) microscopic plants and animals, and those of the interface (benthos) are most easily studied qualitatively and quantitatively. (4) Some pollutants, such as silt, sharply reduce the microscopic populations. (5) The role of the engineer with regard to estuarine studies is that of seeing that adequate biological studies are made, so that he in turn can design and construct the necessary treatment plants and outfalls which will prevent overenrichment or pollution.
W69-04276

ESTUARIES,
American Association for the Advancement of Science, Washington, D. C.
For primary bibliographic entry see Field 02L.
W69-04278

EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
D. Leighton, I. Nusbaum, and S. Mulford.
Water Pollution Control Federation, Journal, Vol 39, No 7, July, 1967, pp 1190-1202.

Descriptors: *Water pollution effects, *Desalination, *California, *Waste disposal, *Intertidal areas, *Aquatic life, Regions, Demineralization, Separation techniques, Water purification, Water treatment, Geographical regions, Pacific coast region, Southwest U. S., Thermal pollution, Water pollution, Brines, Saline water, Water types.

The effects of thermal and brine discharges from the Point Loma, California, desalting plant are described. After a few months of operation, it became evident that the effluents were having a deleterious effect on at least some of the organisms, both plant and animal, which inhabit the intertidal zone. The effects were restricted to the area covered by the effluent streams and under low tide conditions. The authors conclude that the experience at Point Loma provides a clear warning that waste discharge problems would have to be resolved before there could be serious contemplation of considerably larger distillation plants.
W69-04280

MAN AND THE ESTUARY.
For primary bibliographic entry see Field 06B.
W69-04283

VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
T. G. Metcalf, and W. C. Stiles.
Journal of the Sanitary Engineering Division, ASCE, Vol. 94, No. SA4, August, 1968, pp 595-609.

Descriptors: *Oysters, *Water pollution, *Estuarine environments, *Shellfish, Marine animals, Invertebrates, Commercial shellfish, Benthos, Benthic fauna, Fish, Microorganisms, Sewage treatment, Sanitary engineering, Public health, Sewage disposal, Engineering, Environmental engineering, Mollusks, Chemical reactions, Chlorination, Viruses, Wildlife, Aquatic environments, Environment, Waste treatment, Waste disposal, Animals, Aquatic animals, Aquatic life.

Enteroviruses appear in oysters following pollution of estuary waters by waste-treatment plant effluents. Primary treatment, with or without chlorination, and stabilization pond effluents are regular contributors of enterovirus. Increased levels of chlorination accompanied by prolongation of retention time lead to a reduction in the number of viral isolations made from treated effluents. Enterovirus occurs in oysters collected from seawater containing less than 70 Coliform median MPN per 100 ml. Reduction of viral pollutants to undetectable levels in oysters by depuration in estuary waters requires three to six days. Depuration efficacy was adversely affected by large numbers of viral pollutants in oysters, by water temperature falling below 10 C, or both.
W69-04296

ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
J. A. Mihursky.
BioScience, Vol. 17, No. 10, November, 1967, pp 698-702.

Descriptors: *Thermal pollution, *Beneficial use, *Commercial shellfish, *Commercial fish, *Benefits, Water pollution, Animals, Aquatic animals, Aquatic life, Invertebrates, Shellfish, Fish, Wildlife, Heated water, Water types, Water temperature, Temperature, Water properties, Fish food organisms, Ecology, Ecosystems.

Thermal loading of an estuary, common in highly industrial areas, can cause damage in some ecosystems. It can also be used constructively, however, to maintain warm temperatures for the development of food items for commercially important species, and to stimulate growth of commercially important fish and shellfish.
W69-04297

SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
Thurlow C. Nelson.
Estuaries, No. 83, 1967, pp 203-211.

Descriptors: *History, *Parasitism, *Estuarine environment, *Water pollution effects, *Oysters, *New Jersey, *Ecology, Commercial shellfish, Pathology, Aquatic environment, Environment, Animals, Aquatic animals, Aquatic life, Benthic fauna, Benthos, Invertebrates, Marine animals, Mollusks, Shellfish, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Obstruction to flow.

Since the oyster is a very sensitive biological indicator of conditions and is the best scientifically-known of all marine animals, the author uses the history of the oyster population in three New Jersey estuaries to illustrate the effect of nature and man on the ecology of the estuaries.
W69-04304

THERMAL POLLUTION: HOT ISSUE FOR INDUSTRY,
Raul Remirez.
Chemical Engineering, Vol 75, No 7, March 25, 1968, pp 48-52.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Thermal powerplants, *Cooling, Water pollution, Electric powerplants, Engineering structures, Industrial plants, Powerplants, Structures, Steam turbines, Equipment, Turbines, Cooling towers, Heated water, Water types, Water pollution sources, Cost comparison, Analysis, Cost analysis, Mathematical studies.

This article discusses the problem of thermal pollution and presents some current information on the subject. The article states that '...about 70% of the industrial thermal-pollution load is attributed to the steam electric-power industry'. It also states that nuclear plants, expected to be a large percent of future construction, reject about 50 percent more heat than fossil fuel plants. Reservoirs or cooling towers could alleviate the problem, but might increase the cost of electricity one to five percent. Reuse of now wasted heat is one possibility.
W69-04325

MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
For primary bibliographic entry see Field 02L.
W69-04334

THERMAL POLLUTION OF WATER,
R. H. Stroud, and P. A. Douglas.
SFI Bulletin, No. 191, January-February, 1968, pp 1-8.

Descriptors: *Thermal pollution, *Water quality control, *Benefits, *Water pollution effects, Commercial fishing, Water pollution, Beneficial use, Impaired water quality, Water quality, Heated water, Legislation, Control, Quality control.

The authors define water pollution generally as impairment of water quality to a degree which has an adverse effect on beneficial use of the water. They feel that if the desired use of the water is not impaired, there is no pollution. They argue that limited or controlled thermal additions to water can be beneficial. Furthermore, they feel that increased legislation may be necessary to insure that thermal additions are controlled. The effect of thermal pollution in estuaries is discussed.
W69-04345

THERMAL POLLUTION OF WATER.
Sport Fishing Institute Bulletin, No. 191, January 2, 1968.

Descriptors: *Thermal pollution, *Thermal powerplants, *Stream turbines, *Cooling, Nuclear powerplants, Cooling towers, Water sports, Sport fishing, Fishing, Recreation, Economic impact, Water pollution, Electric powerplants, Engineering structures, Industrial plants, Powerplants, Structures, Equipment, Turbines, Aquatic life.

This publication discusses the problem of thermal pollution and makes specific references to estuarine situations. The article states that 'the greatest source of thermal pollution is the steam-electric-station (S.E.S.) industry'. It is predicted that thermal electric production in the United States will amount to 2,000 billion kw per hour by 1980. Such production will require 200 billion gallons of water per day, of which 94 percent would be used for cooling. 'It should also be noted that power plants are invading the estuaries at an accelerated rate. This is evidenced by the fact that 22 percent were located there in 1950, whereas some 32 percent are anticipated to be adjacent to estuaries by 1980.' The article also discusses the potential effects of thermal pollution on aquatic organisms, lists thermal criteria proposed by the National

Technical Advisory Committee on Aquatic Life, discusses cooling tower alternatives for alleviating thermal pollution, and presents some data on sport fishing benefits in Biscayne Bay, Florida.
W69-04349

COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
C. B. Wurtz.
In CLEAN WATER FOR THE NATION'S ESTUARIES, Transcript of Public Meeting, Biloxi, Mississippi, January 17, 1968, p 4.

Descriptors: *Hydroelectric plants, *Heated water, *Ecology, *Aquatic animals, *Thermal pollution, Predation, Pathogenic bacteria, Physiological ecology, Animal metabolism, Animal parasites, Water quality, Bacteria, Electric powerplants, Engineering structures, Industrial plants, Structures, Powerplants, Afterbays, Spawning, Wildlife, Dissolved oxygen, Fish, Animals, Aquatic life, Food chains, Water types, Fisheries, Public health, Microorganisms, Plants.

The author describes five common misunderstnadings about the effects of heated discharges on aquatic life. These misunderstandings relate to the belief that an increase in water temperature will: (1) Cause a reduction in the capacity of the water to retain dissolved oxygen. (2) Cause a deterioration in the 'quality' of the biological community, i.e., less desirable species of organisms will replace more desirable species. This is usually argued as an increase of only two or three degrees without any scale being mentioned. (3) Cause fish to spawn earlier, and at a time when suitable food organisms for survival of the young stages will not be present. (4) Change metabolic rates to the extent that individual organisms will be living under conditions of physiological stress, and thus be vulnerable to adverse conditions they may have otherwise resisted. (5) Cause an increase in the numbers of predators, parasites, and/or pathogens, and thus cause significant deterioration of a fisheries resource or create a public health hazard.
W69-04364

THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
T. Braarud.
Verhandlungen Internationalen Verein Limnology, Vol 12, 1955, pp 811-813.

Descriptors: *Sewage, *Foreign waters, *Marine animals, *Water pollution effects, Water pollution sources, Domestic wastes, Wastes, Water types, Animals, Aquatic animals, Aquatic life.

This article describes the configuration of Oslo Fjord and its apparent role in the pollution effects observed. Brief consideration is given to the effects of sewage on vertebrate and invertebrate marine organisms.
W69-04445

A COOLING POND PROVES CHEAPER,
R. W. Braswell.
Electrical World, Vol 140, No 22, November 30, 1953, pp 84-85.

Descriptors: *Water cooling, *Cooling towers, *Ponds, *Cost comparisons, Streams, Running waters, Rivers, Costs, Riparian rights, Cooling, Engineering structures, Water types, Recirculated water, Water rights, Bodies of water, Lakes, Standing waters, Surface waters, Analysis, Cost analysis, Mathematical studies.

The author evaluates the economics of two methods of cooling: cooling ponds and cooling towers. Cooling ponds were found to be cheaper in initial construction cost, lower maintenance cost, longer life, and about two percent saving in annual operating cost. Estimated costs of both methods have been worked out quite extensively. Direct use of a river for condensing with upstream recirculation was not feasible because of procurement of rights and permissions over the rich farm land.
W69-04447

NUTRIENTS,
Interstate Commission on the Potomac River Basin, Washington, D. C.
Morris L. Brehmer.
In PROBLEMS OF THE POTOMAC ESTUARY, January, 1964, pp 47-50.

Descriptors: *Nutrients, *Eutrophication, *Water quality, *Phosphorus, *Nitrogen, *Cost analysis, Sewage treatment, Waste treatment, Maryland, Virginia, Water pollution sources, Water pollution effects, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Operating costs, Costs, Northeast U. S., Regions, Southeast U. S., District of Columbia, Cities, Inorganic compounds, Metals, Gases, Analysis, Mathematical studies.

The author briefly discusses the problem of secondary pollution stemming from excessive nutrients of sewage origin in receiving waters, with specific reference to the Potomac Estuary. He presents estimates of the daily phosphorous and nitrogen enrichment of the Potomac Estuary by Washington, D. C. Research is advised in order to determine safe nutrient levels for the Potomac Estuary and to develop methods of sewage treatment to remove phosphorus and nitrogen from sewage effluents as an economic by-product. The nitrogen and phosphorous content of sewage from Washington, D. C., if valued at 10 cents and 8 cents respectively per pound, would have a recovered value of about $3,150,000 annually, as compared with the present annual operating cost for the sewage treatment system of about $2,100,000.
W69-04448

AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
G. V. Chambers, and A. K. Sparks.
Institute of Marine Science, Publications, Vol 6, 1959, pp 213-250.

Descriptors: *Water pollution, *Ecology, *Bays, *Fish populations, Southwest U. S., Geographical regions, Coastal plains, Central U. S., Ecological distribution, Water quality, Bodies of water, Dissolved oxygen, Organic matter, Silting, Sedimentation, Oil wastes, Gulf coastal plain, Texas, Sediments, Bottom sediments, Organic matter, Wastes, Industrial wastes, Effluents, Aquatic animals, Animals, Aquatic life, Aquatic populations, Population, Surveys, Regions.

An ecological survey was initiated in the summer of 1957 with data collected at frequent regular intervals. This report includes the comparison of data on temperature, chlorinity, dissolved oxygen, and related quantities with data on fish, shrimp, and crabs caught in trawls. Data are also given on currents, bottom cores, and organic content of sediments. Studies of bottom samples demonstrated that extensive silting has occurred in the ship channel and bays. Low dissolved oxygen, hydrogen sulfide production, and high organic content of the mud in the channel, all indicative of organic pollution, prevent the establishment of a normal bottom fauna. A small temperature gradient was found in the ship channel, two or three degrees higher in the upper channel than in the lower part of the survey area. When dissolved oxygen (D.O.) level is sufficient, a large and diverse population of fishes exists throughout the bays in the survey area and for a considerable distance above the Humble Oil and Refining Company's outfall. No lowering of the dissolved oxygen concentration of the ship channel attributable to Humble's effluent was found, and no effect was found to be exerted on the fish populations of the ship channel and adjacent bays by Humble's operations.
W69-04454

ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
M. A. Churchill.
Sewage and Inustrial Wastes, Vol 26, July 1954, p 887.

Descriptors: *Waste assimilative capacity, *Biochemical oxygen demand, *Dissolved oxygen, *Water pollution effects, Oxygen demand, Southeast U. S., Regions, Geographical regions, Rivers, Bodies of water, Running waters, Streams, Surface waters, Tennessee, Appalachian Mountain region, Central U. S.

The procedure presented in the paper suggests a statistical method to evaluate the effects of pollution load and stream flow on dissolved levels in the rivers. Basic data for Main River in Tennessee have been used for statistical development. A good correlation in regression lines to predict DO drop values for known BOD load condition was obtained.
W69-04456

EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
E. Naylor.
In ADVANCES IN MARINE BIOLOGY, Vol 3, pp 63-104. London and New York: Academic Press, 1965.

Descriptors: *Powerplants, *Thermal pollution, *Estuarine environment, *Growth rates, Engineering structures, Industrial plants, Structures, Aquatic environment, Environment, Rates.

The biological effects of heated effluents on estuarine life are discussed. The growth in volume of heated effluents from power plants in estuarine areas is indicated. It is suggested that there be many situations where siting power plants in estuaries could be beneficial to the marine environment, as well as other situations where such would be detrimental.
W69-04486

ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
Johns Hopkins University, Chesapeake Bay Institute.
D. W. Pritchard, and H. H. Carter
Technical Report No. 33, February, 1965.

Descriptors: *Thermal pollution, *Maryland, *Forecasting, Thermal power, Thermal powerplants, Water pollution, Electric powerplants, Engineering structures, Industrial plants, Powerplants, Structures, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions.

The authors believe 'that the techniques described here will have general application; however, this paper treats the specific case of the heated effluent from the PEPCO Chalk Point Power Plant on the Patuxent estuary in Maryland, which should serve to illustrate the basic concepts'.
W69-04494

THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
C. H. Turner, E. E. Ebert, and R. G. Given.
California Fish and Game, Vol 52, No 1, 1966, pp 28-48.

Descriptors: *Ecology, *Marine animals, *Sewage effluents, *Water pollution effects, *California, Water pollution sources, Effluents, Animals, Aquatic animals, Aquatic life, Geographical regions, Pacific coast region, Regions, Southwest U. S., Outlets.

The authors report that a biological survey in the area of a sewer outfall showed that there was generally a typical faunistic assemblage for the

depths and substrates examined. Two exceptions were (1) a reduced number of species encrusting the last 100 feet of the outfall pipe as compared to the central portion and (2) considerably fewer kinds and numbers of organisms on an artificial reef in the area as compared to other artificial reefs exposed for the same time at the same depths.
W69-04511

EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
Freshwater Biological Association, Ambleside (England).
Winifred Pennington.
J ECOL, Vol 30, pp 326-340, 1942. 1 fig, 8 tab, 18 ref, 2 append, disc.

Descriptors: *Nitrogen compounds, *Nitrogen utilization, *Fresh water, Algae, Nitrate ammonium, Nitrite, Oxidation-reduction potential, Cycling nutrients, Eutrophication.

The experiments described were carried out on mixed cultures of algae and bacteria in a rich culture solution containing nitrate or ammonium. No attempt was made to differentiate between the roles of algae and bacteria in nitrogen utilization. Ammonium and nitrate were both utilized, but ammonium appeared to be used more rapidly. Nitrite was produced from both ammonium and nitrate, and there was evidence that ammonium was produced from nitrate and nitrate from ammonium. In some experiments there was a marked loss of nitrogen from the cultures, apparently due to liberation of nitrogen. (Konrad-Wisc)
W69-04521

ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 02K.
W69-04524

SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT: LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Geology.
Jerome O. Nriagu.
Limnol Oceanogr, Vol 13, No 3, pp 430-439, July 1968. 3 fig, 3 tab, 28 ref, disc.

Descriptors: *Sedimentation, *Sulfur, *Sulfur compounds, Anaerobic conditions, Analytical techniques, Cores, Diagenesis, Eutrophication, Geochemistry, Lakes, Marl, Microbiology, Oligotrophy, Organic matter, Oxidation-reduction potential, Sediments, Sediment-water interface, Sludge, Sulfates, Sulfides, Wisconsin.
Identifiers: *Lake Mendota (Wis), *Lake metabolism, *Sedimentary environment, Sulfureta, RV Kekule, Ekman dredge, Valisneria, Potamogeton, Greigite, Hydrotroilite, Mackinawite, Marcasit, Mineralization, Acid volatile sulfide, Organic sulfur.

Sulfur species in black bottom muds of Lake Mendota, Wisconsin, include sulfide dissolved in interstitial water, acid-volatile sulfides, elemental sulfur, organic sulfur, and sulfates. A black, amorphous, acid-soluble substance, presumably hydrotroilite, is dominant form. No pyrite or marcasite was isolated from the sludge. Nearly 45% of sulfur precipitable as sulfide probably derives from mineralization of organic matter; the remainder, from bacterial reduction of sulfates. In deep-water cores, where anaerobiosis at mud-water interface is normally intense, concentrations of total and sulfide sulfur are sharply reduced in marl compared with those in sludge, discontinuities being demonstrable at sludge-marl interface. All evidence suggests that before changes in sedimentation associated with human activity, lake had developed an anaerbiosis intense enough to permit reduction of sulfates to sulfides but had remained sludge-free by processes of self-purification. Ranges in concentrations, in ppm, of sulfur species (water depth, in meters, within parentheses) are: total, 480 (10.7)--4250 (25.3); total sulfides-sulfur, 280 (10.7)--3600 (25.3); water soluble hydrogen sulfide + HS, 0.0 (10.7 and 15.2)--4.5 (25.3); sulfate-sulfur, 5.3 (10.7)--12.0 (15.2); elemental, 13.2 (18.3)--35.6 (25.3). Report includes descriptions of analytical techniques for total, elemental, sulfate-, and sulfide-sulfur. (Eichhorn-Wis)
W69-04526

5D. Waste Treatment Processes

INDUSTRIAL WASTEWATER RECLAMATION,
Montgomery Research, Inc., Pasadena, Calif.
Carl A. Rambow.
Water and Sewage Works, Reference No 1968, pp R220-R226, Nov 29, 1968. 7 p, 8 tab, 5 ref.

Descriptors: *Water reuse, *Industrial water, *Industrial wastes, *Cost analysis, *Systems analysis, Tertiary treatment, Activated carbon, Coagulation, Electrodialysis, Membrane processes, Oxidation, Reverse osmosis, Chlorination, Flocculation, Filtration.
Identifiers: Industrial water refuse.

The costs of industrial wastewater reclamation are analyzed and tabulated. In many areas, reclaimed water is of higher quality than untreated water, so in some cases reclamation may be the most desirable solution economically and otherwise, even where water is abundant. The tabulated cost data include capital cost of tertiary treatment plants, yearly operating costs of tertiary treatment, basic system costs (activated sludge, coagulation, flocculation, clarification, filtration, and chlorination), basic system costs less secondary treatment costs, electrodialysis costs, and reverse osmosis costs. (Knapp-USGS)
W69-04226

TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05E.
W69-04229

OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
Miami Univ., Coral Gables, Fla. Dept. of Civil Engineering.
D. Thirumurthi.
Water and Sewage Works, Reference No 1968, pp R106-R114, Nov 29, 1968. 9 p, 2 fig, 5 tab, 33 ref.

Descriptors: *Water treatment, *Tertiary treatment, *Ozone, Sewage treatment, Chemical degradation, Aeration, Oxidation, Disinfection, Odor, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: Wastewater renovation, Ozonation.

The use of ozone in water treatment and wastewater renovation is surveyed. Ozone is not only a powerful disinfectant but also a powerful oxidant which can remove color, organic material, iron, manganese, odors, and taste from water, without adding salts, taste, or odor itself. Its deodorizing ability is strong enough to control sewage treatment odor; it is used in sewage plants in New York, Japan, and Florida for this purpose. Laboratory experiments were run to study ozone production methods, the kinetics of BOD and COD removal, and to compare the results of ozonation and aeration. The results are tabulated. A typical ozone plant with a capacity of 120 lb/day costs $70,000 to install and 15 cents per pound of ozone to operate. At these costs, a 10 mgd sewage plant can ozonate about 2 hrs per day at $500 per day, reducing BOD 40-50%, COD 20-50 percent, and ammonia 25%. Using a feed rate of 40 mg ozone in 1.0 liter of sewage, the cost is about 5 cents per 1,000 gal of sewage. (Knapp-USGS)
W69-04230

WATER REUSE FOR PUBLIC SUPPLY,
Black and Veatch, Kansas City, Mo.
Paul D. Haney.
J Amer Water Works Ass, Vol 61, No 2, pp 73-78, Feb 1969. 6 p, 29 ref.

Descriptors: *Water reuse, *Waste, water treatment, Municipal water, Artificial recharge, Irrigation water, Reclaimed water, Sewage treatment, Tertiary treatment, Water pollution, Water utilization.
Identifiers: Chanute (Kans).

The problems, techniques, and history of water reuse are reviewed and discussed. In the U.S., reuse is largely indirect, with cities using the same streams for water supply that upstream cities use for waste removal. When flow is low, this may amount to processing sewage for public supply. Direct reuse of municipal wastewater is less common, but has been done in Chanute, Kansas, when a drought eliminated the water supply. Use of reclaimed water for groundwater recharge is being studied and is already in operation in Europe. Wastewater may be used directly for irrigation; its organic content and nutrients benefit plants if the water is properly reclaimed. Non-municipal sources of stream pollution, including agricultural wastes, fertilizers, and sediments are discussed. National trends in water and wastewater treatment are briefly outlined. (Knapp-USGS)
W69-04265

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
Stanford Univ., Calif.
Jon C. Liebman, and David H. Marks.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 44-59.

Descriptors: *Mathematical models, *Water pollution treatment, *Waste disposal, *Waste treatment, *Cost sharing, Zoning, Regulation, Mathematical studies, Model studies.

The problem of finding appropriate treatment levels for waste discharges located along an estuary on which quality standards are imposed is complex. The uniform treatment method is expensive and inequitable. A cost-minimization model (a mathematical model of the physical characteristics of the water body employed) is efficient, but inequitable. For example, industrial plants A and B located next door to each other have similar products and wastes, but the cost-minimization solution may require A to treat while B does nothing, because the unit cost of treatment is lower at A due to more efficient operation. Thus, A bears the entire brunt of being more efficient while B pays nothing. A zoned solution is proposed wherein waste producers are divided into categories, and treatment levels are found which minimize the cost-subject to the requirement that all members of the category provide the same treatment. A branch-and-bound algorithm is developed to obtain the solution.
W69-04281

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
Eugene P. Odum.
In CLEAN WATER FOR THE NATION'S ESTUARIES, Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, February 29, 1968, pp 7-18.

Descriptors: *Zoning, *Georgia, *Water quality control, *Sewage treatment, *Ecology, *Atlantic coastal plain, Regulation, Property values, Water pollution control, Water pollution treatment, Water treatment, Waste treatment, Natural resources, Resources, Fish harvest, Fishing, Industries, Appalachian Mountain region, Coastal plains, Geographical regions, Regions, Southeast U. S., Value, Quality control, Control, Recreation, Recreation facilities.

The importance of secondary waste treatment is stressed. It is further stressed that the natural high fertility and usefulness of estuaries 'dictates that use and management should be based, as far as possible, on the concept of utilization of existing resources without changing the biological productivity and the basic flow pattern of the system'. On the average, an acre of estuary is worth $500 and should be put to more valuable uses than landfill (where dry land is available) or open sewers for raw wastes. As a basis for future planning, the author proposes a pattern of use zones which have been developed by the State of Georgia. These use regions are: (1) Industrial zones--subjected to extensive modification, where pollution control and maintenance of water quality are of paramount concern, (2) Natural-use zones--where the basic pattern of landscape remains undisturbed and recreation, fishing, seafood production, etc., are the primary objectives, and (3) Research zones.
W69-04306

OPERATING COSTS OF WASTE TREATMENT IN GENERAL MOTORS,
Robert J. Brink.
Nineteenth Industrial Waste Conference, Proceedings, January, 1965, pp 12-16.

Descriptors: *Waste water treatment, *Industrial plants, *Operating costs, Industrial wastes, Treatment facilities, Waste treatment, Water treatment, Wastes, Buildings, Engineering structures, Structures, Costs.

The costs of waste-water treatment at the Buick Division of General Motors Corporation are reported.
W69-04451

DEEDS AND DATA.
Water Pollution Control Federation, Journal, Vol 36, No 4, April, 1964, pp 517-519.

Descriptors: *Sewage treatment, *Operating costs, Maintenance costs, Waste treatment, Costs, Sewage, Municipal wastes.

The article presents operating and maintenance cost experience for secondary sewage treatment facilities for plants of nine municipalities, with average daily sewage volume per plant in range of 0.2 mgd to 51.6 mgd.
W69-04465

INDUSTRIAL WASTEWATER CONTROL,
Fred C. Gurnham.
New York: Academic Press, 1965.

Descriptors: *Industrial wastes, *Industrial plants, *Waste water treatment, *Water pollution control, Water pollution sources, Buildings, Engineering structures, Structures, Waste treatment, Water treatment, Industries.

This is a basic text and reference work on the subject of industrial waste water treatment. It contains chapters on the the industrial waste water control in the following industries: Meat, Fish and fish products, Poultry and eggs, Dairy products, Canned foods, Starch and starch products, Sugar, Fermentation products, Coal mining, Metal mining, Industrial mineral mining, Coke and gas, Iron and Steel, Nonferrous metals, Petroleum, Inorganic chemicals, Organic chemicals, Metal finishing products, Pulp and paper, Textiles, Leather, Power, Atomic energy, Transportation.
W69-04471

1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
Thirty-First Report by the Committee on Government Operations, U. S. House of Representatives, 89th Congress, Second Session. House Report No. 1644, June 22, 1966.

Descriptors: *Federal government, *Water pollution control, *Cooling water, *Industrial wastes, *Sewage disposal, *Discharge measurement, Sewage, Sewage treatment, Wastes, Waste treatment, Control, Water types, Governments, Measurement.

The findings of this survey are reported by agency and individual facility. Estimates are presented for the daily volume of sewage discharge and the percentage treated. In addition, estimated daily discharges of cooling water are reported in connection with industrial discharges. Scheduled completion dates, by facility, for feasibility studies, engineering and design studies, and construction of facilities are listed.
W69-04507

WATER IN INDUSTRY: A SURVEY OF WATER USE IN INDUSTRY.
National Association of Manufacturers, New York; and Chamber of Commerce of the United States, Washington, D. C.

Report, January, 1965.

Descriptors: *Water utilization, *Industrial water, *Waste water treatment, *Operating costs, *Surveys, Industrial wastes, Water pollution, Pollution abatement, Capital costs, Efficiencies, Water types, Wastes, Waste treatment, Water treatment, Abatement, Costs.

The findings of a survey of industrial water use and waste treatment are reported. Intake water volume and process water treatment costs are estimated for various industries. Operating and capital replacement costs are also estimated for effluent treatment facilities. Sundry other quantitative estimates relating to industrial water use, including salt or brackish water intake for several industries, are given. Separate sections are included for the following industries: automobile industry, sugar beet industry, bituminous coal industry, cane sugar industry, chemical manufacturing, grain beverage distilling industry, investor-owned electric utility industry, industrial laundering, meat industry, petroleum refineries, pulp and paper industry, soap and detergent industry, steel industry, and tanning-leather industry.
W69-04514

ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
Hawaii Univ., Honolulu.
Martin J. K. McMorrow, Reginald H. F. Young, Nathan C. Burbank, Jr., L. Stephen Lau, and Howard W. Klemmer.
Tech Rpt No 27, Jan 1969. 33 p, 16 fig, 2 tab, 28 ref. OWRR Project A-001-HI.

Descriptors: *Industrial effluents, *Waste water treatment, Water pollution control, *Biological treatment.
Identifiers: *Anaerobic digestion, Cannery wastes.

The response of pineapple mill waste to anaerobic biodegradation was studied in the laboratory. A simulated mill waste with an oxygen demand equal to actual mill waste was developed from commercial pineapple juice for this study. Ammonium hydroxide was used both as a pH control and nitrogen supplement. The principal factors under study were the temperature of digestion, mixing, and phosphate supplementation for nutrient balance. The digesters were operated for 60 days. Analytical parameters were COD, sugar, pH, ORP, volatile acids, gas production, gas composition, alkalinity, and total bacterial count. Results show that the pineapple mill waste may be satisfactorily treated anaerobically if it is heated, mixed, and fortified with phosphate. Digesters operated at 90 deg F effected 66% COD reduction with gas production containing 75% CH4. The waste undergoes initial COD reduction with a rapid drop in sugar content and a corresponding rise in volatile acids. After a brief delay to regain equilibrium from this acid production stage a steady stabilization of the waste material occurs.
W69-04527

CONDITIONS FOR BETTER FILTERED WATER,
Degremont Co. (France).
G. Degremont, and R. Leviel.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash, D C, Vol 6, pp 983-993, 1968. 11 p, 2 tab.

Descriptors: *Filtration, *Filters, Water purification, Odor, Activated carbon, Ozone, Sludge treatment, Sludge, Settling basins, Flocculation, Organic matter.

Aspects of filtration are discussed. A study of the influence of the physical nature of flocculates led to a new method for measuring the physical cohension of flocculated colloidal matter, thereby enabling dosages of flocculation and coagulation reagents to be adjusted accurately. This new measurement method made it possible to study the influence of the filtration parameters: particle-size distribution, velocity, and method of washing. This in turn permits a quick laboratory examination to define the optimum filter characteristics for any given water. Conversely, fast accurate remedial action can be taken when operating difficulties occur. Research made into the behavior of sludges in so-called sludge-bed sedimentation tanks has led to the development of a rapid settling technique that can be readily adapted to existing plants. Studies also are reported on disposal of organic matter, detergents, substances that cause obnoxious tastes, and viruses, by absorption agents such as active carbon. Powdered adsorption agents can be used in sludge-bed settling tanks with complete deodorization of the treated water and in 'pre-bed' filters to improve disposal of organic matter and detergents. Oxone is used widely in Europe as a virus-destroying agent. (Vorhis-USGS)
W69-04591

5E. Ultimate Disposal of Wastes

CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 05B.
W69-04227

SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,
Dow Chemical Co., Midland, Mich.
J. S. Talbot.
Water and Sewage Works, Reference No 1968, pp R213-R219, Nov 29, 1968. 7 p, 9 fig, 4 ref.

Descriptors: *Waste disposal, *Injection wells, Legal aspects, Social aspects, Public rights, Geology, Hydrologic aspects, Water resources, Water pollution, Groundwater movement.
Identifiers: Disposal wells, Public relations.

The basic disposal factors of deep injection wells and the hazards of well disposal are discussed with particular attention to prevention of damage to potable groundwater, commercial mineral deposits, and mining activities. Economic, public relations, and legal factors are also major considerations for any waste disposal techniques. Most state and Federal laws either encourage or do not discourage deep well disposal, but the legal aspects of trespass on underground property and damages to property by disposal need legal clarification. Well design and surface equipment for deep well disposal are described. A method for calculating the radius of injection and formation capacity for injection is given. Geological hazards which might cause contamination of potable water are briefly described. (Knapp-USGS)
W69-04228

TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
Adnan Shindala.
Water and Sewage Works, Reference No 1968, pp R210-R212, Nov 29, 1968. 3 p, 20 ref.

Descriptors: *Radioactive waste disposal, *Waste treatment, Evaporation, Concrete mixes, Adsorption, Burning, Injection wells, Storage, Dispersion, Waste dilution, Waste storage.
Identifiers: Waste burial, Radioactive waste storage tanks, Disposal wells, Radioactive waste decay.

Radioactive wastes may be treated and disposed of by concentration and storage, dilution and dispersion, and storage for decay. Liquid wastes must be fixed in inert solids to prevent contamination of water. They may be made into concrete, dissolved in non-leachable glass, calcined in aluminum nitrate, adsorbed on clay, and fused into ceramic glaze. The most commonly used process is fixation in concrete and burial. Ion exchange extraction and evaporation are used for radioactive waste concentration for more efficient handling. Deep well injection allows very long-term detention while radioactivity decays. Hydraulic fracturing allows injection into otherwise impermeable rocks such as shale, and cavities may be dissolved in salt beds for waste storage. Several examples of radioactive waste disposal systems now in operation are briefly described. (Knapp-USGS)
W69-04229

POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
Federal Water Pollution Control Administration, Washington, D. C.

Proc Fed Water Pollut Contr Admin Conf, 6th Sess, Denver, Colo, Append A, pp A1-A28, 1967. 28 p, 38 photo.

Descriptors: *Radioactive waste disposal, *Mine wastes, *Waste dumps, Water pollution sources, Path of pollutants, Leaching, Wind erosion, Public health, Colorado River, Colorado River basin.
Identifiers: Radioactive mill tailings piles.

The disposition and control of uranium mill tailings, which are composed largely of sand with very long-lasting low-level radioactivity, are discussed. Tailings piles are eroded and dispersed by wind and water and are leached by percolating water and groundwater. Erosion and leaching should be controlled to prevent spreading of radioactivity into widespread areas. Suggested methods of tailings control include covering of piles and use as road construction material. Major tailings piles in the Colorado Plateau area are discussed in detail and shown by ground and air photographs. (Knapp-USGS)
W69-04272

OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
John D. Parkhurst, Lester A. Haug, and Malcolm L. Whitt.
Water Pollution Control Federation, Journal, Vol 39, No 6, June, 1967, pp 987-993.

Descriptors: *Outlet works, *Pacific coast region, *Design criteria, *Sewage disposal, Conveyance structures, Conduits, Construction costs, Capital costs, Engineering structures, Hydraulic structures, Structures, Waste disposal, Costs, Geographical regions, Regions, Design.

Design requirements for submarine outfalls for disposal of metropolitan sewage wastes are described. Specification data and costs of construction are given for five major submarine outfalls on the Pacific Coast of the United States, with overall lengths ranging from 3,650 feet to 22,000 feet, and with design capacities ranging from 240 mgd to 600 mgd.
W69-04313

'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
For primary bibliographic entry see Field 06D.
W69-04461

5F. Water Treatment and Quality Alteration

CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 05B.
W69-04227

OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
Miami Univ., Coral Gables, Fla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W69-04230

DRINKING WATER SUPPLIES.

N Y State Sanitary Code Ch V Reg 1, 3, 4, 5 (McKinney 1954).

Descriptors: *New York, *Water sources, *Water treatment, *Environmental sanitation, Legislation, Potable water, Water supply, Administrative regulation, Administrative agencies, Fluoridation, Waterways, Water quality, Public health, Legal aspects.

The State Commissioner of Health must approve the addition of fluorine compounds to any drinking water supply. The owners and operators of public water supplies are held to a standard of due care in the maintenance and supervision of such water supplies. Before any new permanent source of water shall be placed in service, a sample must be examined and reported upon by the State Department of Health. (Childs-Fla)
W69-04394

5G. Water Quality Control

A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
Federal Water Pollution Control Administration, Washington, D. C. Div. of Pollution Surveillance.
For primary bibliographic entry see Field 05A.
W69-04222

FRESH WATER,
Mid-Cheshire Water Board (England).
For primary bibliographic entry see Field 03B.
W69-04225

MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES.
National Security Industrial Association, Washington, D. C.

Ocean Science and Technology Advisory Committee, Ocean Resources Subcommittee Meeting, December 12-13, 1967.

Descriptors: *Water pollution, *Disasters, *Water pollution treatment, Water treatment.

This meeting, which covered water pollution disasters, was held in three parts: Part I. Description of disaster and consequences. Part II. Technical capabilities for countermeasure. Part III. Contingency program for prevention and response. Papers with examples and suggestions were given within each category.
W69-04285

THE FUTURE OF AN ESTUARY,
Stanford Univ., Calif.
James C. McCarty, and Howard S. Harris.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 335-369.

Descriptors: *Water quality, *Nitrogen, *Dissolved solids, *Mathematical models, *Water quality control, *California, Southwest U. S., Regions, Control, Quality control, Gases, Pacific coast region, Geographical regions, Water control, Mathematical studies, Model studies, Beneficial use, Streamflow, Channel flow, Flow, Waste treatment, Water treatment.

This paper discusses existing and future water quality in San Francisco Bay and outlines means to cope with pollution's adverse effects on beneficial uses of the Bay water. A mathematical model is employed to predict future water quality in terms of total nitrogen and total dissolved solids. Current nitrogen levels of 2 mg/liter are expected to rise to 7 mg/liter by 1990. Four means of controlling future water quality are defined: (1) control of water at the source, (2) collection and treatment of water, (3) conveyance of wastes, and (4) regulation of streamflow. It is concluded that a major obstacle to the implementation of any control program will be coordinating the diverse interests of the many agencies concerned with water quality in San Francisco Bay.
W69-04290

OIL SPILLAGE STUDY; LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
Battelle Memorial Institute, Pacific Northwest Laboratories, Richland, Washington.

Report to Department of Transportation, United States Coast Guard, AD-666 289, November 20, 1967.

Descriptors: *Disasters, *Oil, *Water pollution, *Beaches, *Oily water, Water pollution effects, Water pollution treatment, Water treatment, Oceans, Bodies of water, Surface waters, Wildlife, Land reclamation, Aquatic life, Wildlife habitats, Environments, Habitats, Waterfowl, Animals, Birds.

A literature review and evaluation of the state of technology of prevention and control of major oil spillage on water. The restoration of the shore face and waterfowl habitats and the effects of oil pollution and defensive measures on aquatic life are also discussed. Specific areas of study summarized in the report include: technical aspects of tank vessel design as related to prevention of oil spillage, destruction or recovery of open sea oil slicks, protection and cleaning of the shore face and estuaries, and the effects of oil pollution and treatment agents on marine flora and fauna.
W69-04309

POLLUTION AND MARINE ECOLOGY.
Theoldore A. Olson, and Fredrick J. Burgess.
John Wiley and Sons, New York, 1967.

Descriptors: *Ecology, *Water pollution, *Littoral, *Energy transfer, *Human resources, *Environmental effects, Transfer, Resources.

This book contains the published proceedings of the 'Conference on the Status of Knowledge, Critical Research, Needs, and Potential Research Facilities Relating to Ecology and Pollution Problems in the Marine Environment'. Various papers were presented under the following broad topics: Man's Resources in the Marine Environment; Dynamics of the Littoral Marine Community; Ecological Systems; Energy Transfer; Interactions Between the Biota and the Chemical-Physical Environment; and Parameters of Marine Pollution.
W69-04310

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
Stanford Univ., Calif.
George D. Pence, Jr., John M. Jeglic, and Robert V. Thomann.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967, pp 537-585.

Descriptors: *Dissolved oxygen, *Mathematical models, *Model studies, *Computer models, Mathematical studies.

A one-dimensional time-varying mathematical model for the simulation of dissolved oxygen in an estuary is developed along with a numerical integration procedure for computer solution. Some applications of the model are presented, including a verification of one year of data and several control scheme simulations. Application of the model to variables other than oxygen and other hydraulic regimes is discussed briefly.
W69-04315

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
Report of Federal Water Pollution Control Administration, Northwest Regional Office, Portland, Oregon, and Washington State Pollution Control Commission, Olympia, Washington, March, 1967.

Descriptors: *Water pollution control, *Costs, *Pulp and paper industry, *Washington, Water pollution, Pollution abatement, Water pollution effects, Pulp wastes, Water pollution treatment, Control, Abatement, Industries, Industrial wastes, Wastes, Geographical regions, Pacific coast region, Pacific northwest U. S., Regions, Water treatment.

The study's conclusions are primarily qualitative rather than quantitative. Specific recommendations are made concerning actions that the mills should be required to undertake to abate pollution, but these recommendations are apparently not based on any quantitative estimates of damage caused to competing uses, nor on estimates of investment outlays which would be required to satisfy the recommendations.
W69-04319

SPILL POLLUTION - ITS EFFECTS AND CONTROL,
National Security Industrial Association, Washington, D. C.
J. M. Rademacher.
In MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES, Ocean Resources Subcommittee Meeting, December 12, 1967.

Descriptors: *Disasters, *Water pollution treatment, *Water pollution effects, Fishkill, Wildlife, Water pollution.

The author describes three incidents in which toxic material was accidentally spilled into the water. In all three incidents damage to marine wildlife was disastrous, and the lack of effective combative operations in these three cases pointed toward the need for a 'pollution emergency control program'. Such a program is described.
W69-04322

A REPORT ON POLLUTION OF THE NATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES.
Report to The Secretary of the Interior and The Secretary of Transportation, 1967.

Descriptors: *Water pollution, *Oil, *Federal Government, *Legislation, *Water pollution control, Harbors, Control.

This report is the result of a special study requested by the President to determine how the resources of the nation could better cope with oil pollution problems and with other pollutants and hazardous substances. The findings include: (1) Identification of the major sources of danger. (2) An assessment of the existing resources, legal authorities, and capabilities to attack this problem. (3) A recommended action program to set forth the administrative and legislative steps needed to deal with the problems of oil and other pollution control.
W69-04326

REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.

In CLEAN WATER FOR THE NATION'S ESTUARIES, Transcript of Public Meeting, Biloxi, Mississippi, January 17, 1968, p 6.

Descriptors: *Water quality, *Texas, *Water utilization, *Electric powerplants, Cooling water, Water temperature, Heated water, Engineering structures, Structures, Industrial plants, Temperature, Fish, Water types, Animals, Aquatic animals, Aquatic life, Wildlife, Thermal pollution, Central U. S., Coastal plains, Geographical regions, Gulf coastal plain, Regions, Southwest U. S., Efficiencies, Powerplants, Water pollution, Water properties.

It was pointed out that the proposed water temperature standard ('not more than a 2 C increase in ambient temperature at 100 yards from point of discharge') could result in curtailment of the operation of electric power plants as well as other industrial plants using water for cooling purposes and would seriously restrict the future development of electric power in Texas. It was also stated that there is no evidence that the present use of the waters of Texas for cooling purposes has been harmful in any way to other uses of the water including its use for fish and wildlife and for recreation.
W69-04327

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
Stanford Univ., Calif.
Richard L. Rosenberger, and Raymond Walsh.
In PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON ESTUARINE POLLUTION, August 23-25, 1967.

Descriptors: *Legislation, *Water quality control, *California, *Planning, Long-term planning, Economic impact, Salinity, Mathematical models, Bays, Deltas, Southwest U. S., Regions, Pacific coast region, Geographical regions, Control, Quality control, Mathematical studies, Model studies, Water pollution, Chemical properties, Water properties, Bodies of water.

The San Francisco Bay-Delta Water Quality Control Program, which is a three-year study to develop a comprehensive plan for water quality control in the San Francisco Bay-Sacramento-San Joaquin Delta area of California, is summarized in this paper. Vast water development projects which would ultimately result in the complete control of inflow to the Delta and Bay are discussed. The Program's total study area covers nearly 40 percent of the state.
W69-04331

RULES ON VESSEL POLLUTION PROPOSED BY SENATOR MUSKIE.
Traffic World, Vol 132, No 3, October 21, 1967, p 101.

Descriptors: *Water pollution control, *Legislation, *Ships, Navigation, Water pollution sources.

This is a news item describing a bill to regulate discharge of wastes from vessels in United States waters.
W69-04332

SAVING OUR ESTUARIES.
Ocean Industry, Vol 2, No 10, October, 1967, pp 3-4.

Descriptors: *Water pollution control, Water pollution, Control, Water quality control, Quality control.

This article discusses steps being taken by the Federal Water Pollution Control Administration regarding estuaries.
W69-04333

WHAT'S AHEAD IN OIL RECOVERY,
John Scott.
Petroleum Engineer, Vol 39, November, 1967, pp 61-64.

Descriptors: *Oil reservoirs, *Secondary recovery (Oil), *Oil industry, Flooding, Injection, Oil, Methodology, Planning, Industries.

Total oil in-place figures are presented in comparison with a past recovery percentage of 15 percent (1930), a present percentage of 30 percent (1967), and a future recovery percentage of 40 percent (1987). Tables show past, present, and future (1980) figures of primary versus secondary recovery totals. Present and future secondary oil recovery techniques are also examined.
W69-04335

STATEMENT.
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.

In CLEAN WATER FOR THE NATION'S ESTUARIES, Transcript of Public Meeting, Biloxi, Mississippi, January 17, 1968, p 8.

Descriptors: *Mississippi, *Cooling towers, *Water utilization, *Thermal pollution, *Powerplants, Aquatic populations, Aquatic life, Surface waters, Streams, Running waters, Economic justification, Water quality, Standards, Heated water, Electric powerplants, Engineering structures, Industrial plants, Bodies of water, Interstate rivers, Populations, Rivers, Mississippi River, Southeast U. S., Regions, Structures, Water pollution, Water cooling, Cooling, Coastal plains, Geographical regions, Gulf coastal plain, Water types.

The Mississippi Power and Light Company contends that since it has found no change in aquatic life near discharge points of heated effluents, and since the dissipation of such effluents occurs almost immediately upon discharge into cooler waters, the cost of cooling towers is not justifiable. The evaporation of water which would occur at the Vicksburg plant, furthermore, would be in excess of 5.7 million gallons a day. They state that cooling standards ('Temperature shall not be increased more than 10 F above the intake natural prevailing background temperature after reasonable mixing a discharge water with surrounding waters.') which are applied generally in Northern sections of the United States are not realistic for the Vicksburg, Mississippi, powerplant.
W69-04342

REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
National Security Industrial Association, Washington, D. C.
Carl H. Strandberg.
In MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES, Ocean Resources Subcommittee Meeting, December 12, 1967.

Descriptors: *Water resources, *Aerial photography, Remote sensing, Photography, Environmental effects, Water quality control, Resources, Analytical techniques, Data collections, Quality control, Control.

Urban centers so dependent on a centralized water supply need the security of an assured supply and quality level. 'Aerial remote sensors open many new avenues of approach for analysis of water quality. Many water quality degrading factors result in changes in water color, clarity, density, and viscosity. Aquatic population changes occur, and these may also change water color and clarity. Aerial photographs and imagery obtained using nonphotographic sensors can be used to record significant facts and events.' Using these methods, comprehensive surveillance of water supplies will be possible.
W69-04343

COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
Gerald A. Strobel.
Journal of the Sanitary Engineering Division, ASCE Vol 94, No SA4, August, 1968, pp 641-656.

Descriptors: *Coliforms, *Water pollution, *Shellfish, *Public health, Sanitary engineering, Engineering, Environmental engineering, Animals, Aquatic animals, Bacteria, Microorganisms, Plants, Breeding, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Aquatic life.

The fecal coliform-coliform relationship has been examined for several estuaries on Long Island to evaluate proposed fecal coliform standards for shellfish growing waters. The level of fecal coliforms to coliforms was found to vary with source of pollution, level of treatment provided, characteristics of the receiving waters, and precipitation on the watershed. The data demonstrated that correlations for relating fecal coliform limits to present coliform standards must take into account the particular characteristics of each shellfish growing area. These correlations should be used until the level of public health hazard associated with the various standards is better determined and can be used to define new standards based on the public health significance associated with their use.
W69-04344

PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
National Security Industrial Association, Washington, D. C.
Leo Tobias.
In MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES, Ocean Resources Subcommittee Meeting, December 12, 1967.

Descriptors: *Oily water, *Beaches, *Disasters, Shore protection, Chemcontrol, Environmental effects, Mechanical control, Water pollution control, Water pollution treatment, Control, Physical control.

Defensive measures taken to combat the 'Torrey Canyon' oil spill were experimental in nature, since knowledge of effective techniques to combat oil spills is lacking. The primary objective of oil spill defensive measures is to contain the oil at sea and prevent, as much as possible, the deposition of oil on the beaches. Four methods are proposed in preventing the spread of oil on beaches: (1) use of a floating boom, (2) underwater bubble system, (3) covering beaches with polyethylene sheets, and (4) construction of a barrier dike. If the beaches should become covered with oil, two restorative techniques are proposed: (1) the chemical method, using detergents to cleanse the oil, and (2) the mechanical method, involving removal of the oil-soaked layer of sand. Although the chemical method is easier, it has been criticized for its harmful effect on the marine life of the area.
W69-04350

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.

In CLEAN WATER FOR THE NATION'S ESTUARIES, Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, February 29, 1968, pp 1-15.

Descriptors: *Georgia, *Water pollution effects, *Water utilization, *Value, Planning, Water quality control, Control, Quality control, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., History, Efficiencies.

The statement discusses effects which various uses will have on the estuarine region. Six aspects are covered in the report: (1) Description of physical and biological aspects of estuaries. (2) Emphasis on unique features of the estuarine complex in Georgia. (3) Historical background of estuarine degradation along the east coast of the United States (New Jersey and Florida). (4) Description of uses and value of salt marsh-estuarine complex in its present form and kinds of uses to which it may be put. (5) Effects of various pollutants on estuaries. (6) Recommendation of plans for zoning of the estuarine region of Georgia to separate incompatible uses as well as pollutants. Waste disposal is the biggest industrial use of Georgia's estuarine zones; sport fishing is the next important use, amounting to $51,000,000 in revenues in 1963; and commercial fishing follows with a value placed at $10,000,000 in 1965. Many of Georgia's estuaries still approximate their natural condition, which is important to research.
W69-04353

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
William J. Verross.
In CLEAN WATERS FOR THE NATION'S ESTURARIES, Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, February 29, 1968, pp 46-52.

Descriptors: *Water quality, *Legislation, *Water utilization, *Georgia, *Pulp and paper industry, Water pollution conrol, Water pollution, Water pollution sources, Ecology, Industries, Efficiencies, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S.

The Georgia Pulp and Paper Association submits the following points for consideration: (1) Georgia's existing law, rules, and standards involving water quality are more than adequate to protect the state's estuaries and coastal waters. (2) There is need for a great deal more research on the ecology of estuaries before additional regulation or legislation is imposed over coastal waters. (3) The Georgia Pulp and Paper Association feels that concurrent multiple use of estuaries is possible, desirable, and practical.
W69-04354

WASTE FROM WATERCRAFT.
Federal Water Pollution Control Administration, Washington, D. C.

Senate Document No. 48, 90th Congress, First Session, August 1967.

Descriptors: *Water pollution, *Ships, *Federal government, *Legislation, *Navigable waters, *Wastes, Governments, Bodies of water, Water pollution control, Control, Water pollution effects, Data collections.

This document, a report on vessel pollution in the navigable waters of the U. S., was submitted by the Secretary of the Interior to the 90th Congress, in compliance with the Clean Water Restoration Act of 1966. The report contains basic data and information on the following: (1) Dimensions, sources, and effects of the watercraft pollution problem. (2) Pollution control mechanisms. (3) Summary of existing laws and regulations (both federal and state) regarding watercraft pollution problem. (4) Ongoing activities on controlling watercraft pollution. Also, a proposed program for the control of pollution from vessels is outlined.
W69-04357

WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
Federal Water Pollution Control Administration, Middle Atlantic Region, Charlottesville, Va.

CB-SRBP Working Document No. 14, June, 1967.

Descriptors: *Water quality, *Water pollution control, *River basins, *Estimated costs, Chemical properties, Dissolved oxygen, Hydrogen ion concentration, Regions, Costs, Solid wastes, Wastes, Toxicity, Sewage treatment, Waste treatment, Control.

This report covers immediate pollution control needs and estimated costs for providing these needs. The present water-quality conditions and biological study of the upper reaches of the James River and tributaries are summarized. The following basic criteria were used in achieving cost estimates for new facilities: (1) Dissolved oxygen not lower than 4 mg/l in the stream, (2) No appreciable settleable or floating solids, (3) No noticeable coloration or discoloration of receiving streams, (4) Toxic substances to be reduced below the toxicity of streams, (5) No appreciable change in pH of the receiving streams, and (6) Stream flow for design of sewage treatment facilities equal to minimum average seven-day low flow occurring on 10-year frequency.
W69-04359

WATER IMPROVEMENT COMMISSION.
Ala Code tit 22 secs 140 (6)-140 (9) (Supp 1967).

Descriptors: *Alabama, *Administrative agencies, *Water pollution control, *Water quality control, Water resources development, Administration, Water conservation, Water purification, Legislation, Legal aspects, Water pollution treatment, Pollution abatement, Permits, Regulation, Surface waters, Groundwater, Investigations, Programs, Planning, Sewage disposal, Standards, Control.

These statutes create the Water Improvement Commission for the purpose of improving and conserving the ground and surface waters of Alabama. The duty of the Commission is to control pollution in the waters of the state, and it shall have the powers to study and investigate all problems concerning improvement and conservation of such water and prepare programs to handle these problems. The Commission shall establish criteria standards for recognized limits of pollution, issue permits for the discharge of sewage, investigate the discharge of pollution into the waters of the state, and issue any orders necessary to execute the provisions of this chapter. (Sisserson-Fla)
W69-04377

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
341 Ill App 316, 93 NE 2d 441-443 (1950).

Descriptors: *Illinois, *Water pollution, *Industrial wastes, *Riparian rights, Effluents, Water law, Industrial plants, Water pollution sources, Pollutants, Pollution abatement, Downstream, Streams, Waste water (Pollution), Chemicals, Seepage, Sumps, Damages, Legal aspects.
Identifiers: Injunctions.

Defendant light and chemical company drained liquid refuse into a sump on its premises. The sump

had no outlet, it being thought that the earth would absorb the refuse. However, chemicals seeped into a nearby storm sewer which emptied into a stream flowing through petitioner's land. Petitioner sought an injunction to permanently restrain the company from further polluting the stream. While the proceeding was pending, defendant took measures to alleviate the problem. The lower court found that the pollution, although continuing, was inconsequential as compared to the effect on defendant if the junction was granted. The appellate court affirmed, sustaining the lower court's finding that damages, if any, were insignificant and would not support injunctive relief. (Wheeler-Fla)
W69-04382

HOUSEBOATS, SANITATION AND LOCATION.

Mich Comp Laws Ann secs 123.591-123.593 (1967).

Descriptors: *Michigan, *Boats, *Environmental sanitation, *Waste disposal, Local governments, Legislation, Cities, Lakes, Rivers, Canals, Navigable waters, Jurisdiction.
Identifiers: *Houseboats, *Enforcement, *County ordinances, *Violations, Penalties (Civil).

In portions of a county outside the limits of any incorporated city or village, the county board of supervisors may regulate by ordinance the sanitation requirements and location of houseboats on waters of the county within their jurisdiction. The boards shall designate a proper county or township official as an enforcement officer, and any violation of the ordinances shall be punishable as a misdemeanor. (Harris-Fla)
W69-04388

SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.

N Y Pub Health Law sec 1104 (McKinney 1954).

Descriptors: *New York, *Water purification, *Water works, *Pollution, Legislation, Sewage, Water supply, Cities, Condemnation, Administrative agencies, Regulations, Sewage treatment, United States, Legal aspects.

The Department or the Commissioner of Water Supply, Gas and Electricity of the city of New York or the Board of Water Supply may, in order to protect a water supply from contamination, require construction and maintenance of a sewerage system. The necessary real estate, or interests therein, may be acquired by condemnation. All costs are to be paid by the person, municipality, corporation, state or state institution, park, reservation, or post owning the waterworks benefited. (Childs-Fla)
W69-04390

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
NY Public Health Law secs 1200, 1201, 1202 (b,c,d,e,f,i,j,l), 1205, 1220, 1221, 1222, 1225, 1250, 1251, 1252, 1260, 1261 (McKinney Supp 1968).

Descriptors: *New York, *Public health, *Water pollution control, *Sewage, Water resources development, Legislation, Water purification, Wild life, Surface waters, Underground streams, Sea water, Tidal waters, Organic wastes, Natural resources, Sewage disposal, Sewage treatment drainage, Conservation, Shellfish, Riparian rights, Industrial wastes.
Identifiers: Public policy, Marine district.

The state of New York has passed extensive legislation dealing with the problem of water pollution and the protection of public health and fish and wildlife. Their purpose is to safeguard the waters of the state from pollution. All waters of the state are included in the act. A water resources commission is set up to classify the waters and determine the standard of purity that should be maintained in each body of water. Water is classified according to its usage, i.e., drinking, bathing, fishing, and then assigned a standard of purity that must be maintained. Hearings by the commission to determine said standards are to be public. Pollution of water beyond the purity standard is made illegal as to both fresh and salt water. Permits must be obtained for the operation of a disposal system. Civil and criminal penalties are established for violation of these provisions and the use of injunctions are expressly authorized. No person other than the state acquires any actionable rights by virtue of the provision and it is in no way designed to create new or enlarge existing rights of riparian owners. (Shevin-Fla)
W69-04392

STATE SANITARY CODE.

N Y Pub Health Ch 5 reg 6, 8, 9, 10 (McKinney App 1954).

Descriptors: *Water supply, *Water treatment, *Water purification, *Sanitary engineering, Regulation, Potable water, Pipelines, Water delivery, Reservoirs, Water pollution treatment, Administrative agencies, Water quality, Public health, Storage, Chlorination, Disinfection, New York, Water supply.
Identifiers: *Emergency water supply.

The State Sanitary Code imposes certain duties and regulations on owners of public water supplies. The first regulation requires the owner to install an appropriate water treatment plant to prevent pollution. The next regulation provides that the local health officer collect samples from the distribution system of each public water supply. He may take additional samples as is deemed necessary to insure adequate sanitary quality. The third regulation prohibits the owner of a public water supply from taking or using water from an emergency source other than the regular or auxiliary sources. Neither shall the owners discontinue chlorination treatment nor make any quality change without first notifying the proper authorities. The regulations finally provide that no basin, pipe, tank, reservoir or other structure through which water is delivered for potable purposes shall be used until it has been disinfected in a manner approved by the State Health Commissioners. However, this provision does not apply to structures which subsequently satisfactorily treat and purify water used. (Stewart-Fla)
W69-04395

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.

N Y State Sanitary Code ch 6 reg 12 (McKinney 1954).

Descriptors: *New York, *Environmental sanitation, *Water quality, *Public health, Legislation, Administrative regulation, Swimming pools, Water analysis, Coliforms, Alkaline water, Standards, Recreation facilities, Pollution, Bacteria, Beaches.

Provision is made for the determination of the sanitary quality of water in artificial swimming pools or bathing beaches through bacteriological examination. The examinations are to be conducted in accordance with the 'Standard Methods of Water Analysis' of the American Health Association. Standards of bacteriological quality, chemical quality and cleanliness that must be maintained in pools or bathing beaches are established. (Childs-Fla)
W69-04396

NAVIGABLE WATERS OF THE STATE.
For primary bibliographic entry see Field 04A.
W69-04397

CONSERVATION LAW.
N Y Conserv Law sec 427, as amended (McKinney Supp 1968).

Descriptors: *New York, *Water resources development, *Planning, *Water quality control, Legislation, Water pollution control, Administration, Regulation, Water conservation, Legal aspects, Administrative agencies, Standards.
Identifiers: Penalties (Criminal).

The Water Resources Commission is directed to perform duties with respect to water pollution control as provided in Article 12 of the Public Health Law. The Commission may also: (1) alter paragraph (c), subdivision 7, sec 1205, of that Law relating to water quality standards; (2) classify or alter existing classifications of the waters of the state; (3) alter the standards of quality established for the waters of the state. The Commission is authorized to adopt and enforce rules governing the use of chemicals in the waters of the state for purposes of controlling aquatic vegetation, fish, and insects; notwithstanding the Public Health Law or Conservation Law. Any violation of such rules shall be a misdemeanor. (F.H. Molica-Fla)
W69-04400

WATER QUALITY MANAGEMENT AND CONTROL.

N Y Conserv Law sec 835 Art 5 secs 5.1, 5.2 (McKinney Supp 1968).

Descriptors: *New York, *Water management, *Water quality, *Administrative agencies, Legislation, Water pollution control, Water pollution effects, Adoption of practices, Water conservation, State jurisdiction, Contracts, Surveys, Public benefits, Water utilization, River basins, Watersheds, Water resources development, Financing, Legal aspects, Investigations.

These sections deal with water quality management and control. Section 5.1 gives the commission power to undertake investigations, studies, and surveys pertaining to existing water quality, effects of projected operations on water quality, and probable future water quality. The commission may erect and maintain projects and facilities and expend funds for these purposes. Section 5.2 provides that the commission shall encourage and coordinate efforts to prevent, reduce, control, and eliminate water pollution and to maintain water quality as required by the comprehensive plan. (Heckerling-Fla)
W69-04404

COUNTY SEWERAGE AUTHORITIES.
N J Stat Ann secs 40:36A-1 to 40:36A-2, 40:36A-19, 40:36A-21 to 40:36A-23.2, 40:36A-26, 40:36A-33 to 40:36A-37 (1967).

Descriptors: *New Jersey, *Legislation, *Sewage, *Sewage districts, Sewage treatment, Domestic wastes, Industrial wastes, Municipal wastes, Pumping plants, Water pollution, Water pollution sources, Water pollution effects, Sanitary engineering, Drainage systems, Water quality, Cities, Disposal, Rivers, Administration, Local government, Public health, Safety, Condemnation, Construction, Filters, Legal aspects.

This statute authorizes the establishment of a sewerage district and district authority, and grants certain powers to the district once established. Any county wherein is located a river subject to unsafe pollution from more than one city may establish a sewerage district for the purpose of protecting such river from pollution. Where a sewerage district is established, a district authority shall be created with 7 members serving staggered terms. An authority shall be a body politic and corporate with perpetual succession as a governmental instrumentality for the purpose of protecting the public health and welfare. It shall possess the power to: (1) sue and be sued; (2) adopt a corporate seal; (3) contract debts and issue bonds; (4) acquire and

dispose of property; (5) make and perform contracts; and (6) do all other acts necessary to provide the best plan for abating pollution in any river. No competitive district for similar purposes shall be established by the county or state impairing the rights of bond holders under this act. An authority may contract with adjacent authorities to initiate joint action aimed at pollution abatement wherever such a joint plan is necessary. Pollutants may not be directly discharged into waters in any district, and any district may enforce this prohibition by necessary legal action. The State Board of Health shall approve any construction plans authorized by this act. An authority shall have full power to acquire land if necessary to effect the purposes of this act. Such acquisition may be by purchase or through condemnation proceedings. (Helwig-Fla)
W69-04415

HEALTH AND VITAL STATISTICS: COUNTY BOARD OF HEALTH.
NJ Stat Ann secs 26:11-10 (i) (1964).

Descriptors: *Legislation, *New Jersey, *Supervisory control, *Landfills, Sewerage sludge treatment, Waste dumps, Marshes, Stagnant water, Regulation, Control, Public health, Sanitation, Administrative agencies, Sewers.

This statute authorizes the county board of health to regulate, control and prohibit the cleaning of sewers, dumping of garbage and the filling of sunken lots. It also empowers the board to provide for the filling of sunken lots which have become repositories of stagnant water in the built up portions of the county. (Stewart-Fla)
W69-04420

NUISANCES AFFECTING HEALTH.
N J Stat Ann secs 26: 3B-1 to 26: 3B-17 (1964).

Descriptors: *New Jersey, *Water pollution control, *Public health, *Mosquitoes, Legislation, Water supply, Water pollution, Waste disposal, Potable water, Wastes, Bodies of water, Oceans, Cities, Effluents, Treatment facilities, Legal aspects.

The maintenance of a water supply used for drinking or culinary purposes which is polluted or impure is prohibited. No person may maintain any means of disposal of human excrement which gains access to any public or private water supply. The deposit of human excrement in any water supply is prohibited. The deposit of waste matter causing pollution of the ocean or other body of water is prohibited. The maintenance of pools, cisterns, ditches, or streams in which mosquitoes breed is prohibited. Effluents from sewage or industrial waste treatment plants are not contemplated as being within the activities prohibited by the act. The procedures to be followed in the enforcement of this act are provided. Annotations are included. (Childs-Fla)
W69-04424

DECLARATION AND ABATEMENT OF NUISANCES.
N J Stat Ann secs 26:3-45 to 26:3-63 (1964).

Descriptors: *New Jersey, *Public health, *Inspection, *Permits, Legislation, Administrative agencies, Administrative regulation, Mosquitoes, Local governments, Legal aspects, Docks, Piers.
Identifiers: Nuisances, Vessels.

The local board of health may pass, alter, or amend ordinances and make rules and regulations to declare and define what shall constitute a nuisance in or upon lots, streets, docks, wharves, vessels and piers, and all public or private places within its jurisdiction. Procedures are provided for the abatement of such nuisances when declared. (Childs-Fla)
W69-04425

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.

N J Stat Ann secs 26:3-31 (1963).

Descriptors: *New Jersey, *Water pollution control, *Water supply, *Public health, Legislation, Administrative agencies, Administrative regulation, Water pollution, Cities, Permits, Ice, Sewers, Plumbing, Legal aspects, Operation and maintenance, Local governments, State governments, Construction.

The local board of health is empowered to pass, alter, or amend ordinances and to regulate for the following purposes: (a) to protect the public water supply; (b) to prohibit cutting or sale of ice detrimental to the public health; (c) to license and regulate the sanitary conditions of public eating houses; (d) to compel property owners to connect with any sewer passing such property; (e) to regulate the practice of plumbing; (f) to regulate and prohibit the accumulation of offal and any decaying or vegetable substances; (g) to regulate the location, construction, and operation of any place used to receive or store human excrement; (h) to regulate the cleaning of any sewer, dumping of garbage, and filling of any marsh land; and, (i) to license and regulate the business of cleaning cesspools and privies. (Childs-Fla)
W69-04428

PROTECTING THE POTOMAC AT WASHINGTON,
David V. Auld.
Water Pollution Control Federation, Journal, Vol 37, No 3, March, 1965, pp 275-288.

Descriptors: *District of Columbia, *Sewers, *Flow separation, *Capital costs, *Pollution abatement, Water pollution control, Construction costs, Conduits, Conveyance structures, Detached dwellings, Growth rates, Rates, Population, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., Abatement, Northeast U. S., Engineering structures, Hydraulic structures, Structures, Costs, Cities.

The author describes a pollution abatement program and investments in the Washington, D. C., metropolitan area. Brief capital cost estimates of alternative plans considered by the Washington Metropolitan Council of Governments are presented. The population growth in the Washington, D. C., metropolitan area is projected through the year 2000. Capital-cost outlays for storm and sanitary sewer separation projects for small segments of the metropolitan area are tabulated. These costs are reported to have averaged about $1,500 per house for detached dwellings when contracts for separation have involved groups of 30 to 75 houses.
W69-04437

'WASTE DISPOSAL AND WATER SUPPLY',
Interstate Commission on the Potomac River Basin, Washington, D. C.
David V. Auld.
In PROBLEMS OF THE POTOMAC ESTUARY, January, 1964, pp 13-18.

Descriptors: *Waste disposal, *Water pollution control, *Biochemical oxygen demand, *Flow augmentation, *District of Columbia, Water supply, Supply, Virginia, Maryland, Forecasting, Population, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Dams, Engineering structures, Hydraulic structures, Northeast U. S., Regions, Southeast U. S., Oxygen demand, Cities, Human population, Control, Flow control, Regulation, Structures.

The use of the Potomac Estuary for domestic waste assimilation is examined. Reductions in biochemical oxygen demand from the installation of secondary treatment facilities in the Washington, D. C., area are discussed. Estimates of BOD loading in 1950 and in the current year are given. A system of dams for flow augmentation is advocated to offset effects of population growth in the Washington, D. C., area.
W69-04438

A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
David F. Bramhall, and Edwin S. Mills.
Water Resources Research, Vol 2, No 3, 1966, pp 615-616.

Descriptors: *Water pollution control, *Industrial pollution, *Effluent, *Assessments, Control.

The authors review schemes for controlling industrial pollution by systems of effluent charges as opposed to systems of subsidies, with respect to short-run economic effects. They caution that the conclusions reviewed are incomplete because they deal with short-run effects only, and that there is an important asymmetry in long-run economic effects due to differences in amount of entry and exit in the long-run, depending on whether a fee or charge method is selected for use.
W69-04446

WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
S. V. Ciriacy-Wantrup.
Journal of Farm Economics, Vol 43, No 5, December, 1961.

Descriptors: *Water quality, *Standards, *Social values, *Administration, Water pollution control, Control, Value, Cost-benefit analysis.

A general discussion of the incidence of social costs and benefits in water quality management is presented. Political and economic factors pertinent to formulation of policy objectives in water quality management are considered. Arguments are presented for a minimum quality standard for receiving waters, based on the quality required to support fish life.
W69-04457

EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
H. L. Elmore, and W. F. West.
Journal of the Sanitary Engineering Division, Vol 87, No SA6, November, 1961, pp 59-71.

Descriptors: *Reaeration, *Water temperature, *Bibliographies, *Turbulence, Temperature.

A search of the literature indicated that the effect of water temperature on stream reaeration rates had not been definitively established. A series of carefully controlled experiments reported by the authors established that the temperature coefficient and reaeration coefficient remained substantially constant over a wide range of turbulence conditions and throughout the temperature range found in natural streams.
W69-04468

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
Maryland Water Resources Commission, Annapolis; and Department of Water Resources, Annapolis, Md.

Water Resources Regulation 4.8, May 22, 1967.

Descriptors: *Standards, *Water quality, *Water pollution, *Maryland, *Water law, *Water supply, *Shellfish, Control, Legal aspects, Appalachian Mountain Range, Atlantic coastal plain, Coastal plains, Supply, Fish harvesting, Fish, Wildlife, Geographical regions, Regions, Northeast U. S., Animals, Aquatic animals, Aquatic life, Recreation.

Pollution and types of pollution are defined in this law. Specific waters in Maryland and standards to be exacted from these waters are listed in detail. The following water-use categories are indicated: (1) shellfish harvesting, (2) public or municipal water supply, (3) water contact recreation, (4) propagation of fish, other aquatic life and wildlife, (5) agricultural water supply, (6) industrial water supply.
W69-04470

ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
J. D. O'Connor.
Journal of the Sanitary Engineering Division, (ASCE), Vol 91, No SA1, February, 1965, pp 23-42.

Descriptors: *Mathematical models, *Waste assimilative capacity, *Water quality, *Delaware River, Rivers, Mathematical studies, Model studies, Bodies of water, Interstate rivers, Running water, Streams, Surface waters.

The application of various mathematical methods to the determination of water quality and pollution conditions in estuaries is demonstrated. Many of the estuaries of the eastern coast of the United States are characterized by uniformity over the vertical and lateral planes. This condition, reducing the basic equations to a one-dimensional problem, is analized for three common coordinate systems that describe the geometry of the various estuaries. Various types of spatial and temporal inputs are considered. The final equations are used to define the longitudinal distribution of various nonconservative substances in the estuaries of the Delaware, the East, and the James Rivers. Data from both model tests and field surveys are provided for comparison with the predicted profiles.
W69-04489

POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES.
Report, US Department of Health, Education, and Welfare, Public Health Service, Division of Water Supply and Pollution Control, September, 1965.

Descriptors: *Hudson river, *Recreation, *Water pollution, *Ships, Beaches, Parks, Bodies of water, Rivers, Running water, Streams, Surface waters.

This report contains some information related to the Hudson Estuary, although it is difficult to separate the information on the River from that relating strictly to the Estuary. Information on recreation and shipping in the estuary is provided, including a list of public beaches and waterfront parks.
W69-04490

BIBLIOGRAPHY ON AIR AND WATER POLLUTION,
Marie S. Richardson.
Special Libraries, July-August, 1966, pp 385-390.

Descriptors: *Water pollution, *Bibliographies, *Air pollution.

This bibliography includes literature references as well as originating sources of information on air and water pollution.
W69-04496

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
Matthew J. Sobel.
Water Resources Research, Vol 1, No 3, 1965, pp 477-487.

Descriptors: *Mathematical models, *Water quality control, *Cost-benefit ratio, *Water treatment, Systems analysis, Model studies, Mathematical studies, Control, Quality control, Regional analysis, Costs.

In recent years, the rate of investment in facilities for water-quality control has increased, and the need to program water-resources use on a regional basis has been recognized. This paper outlines the nature of regional water-quality systems and presents programming models for several water-quality improvement problems. A linear programming formulation of a static improvement in quality is contrasted with a traditional policy for programming improvements; the traditional policy results in a mixed-integer problem. The maximization of the ratio of benefits to costs of an improvement program is transformed to a linear programming problem. A stochastic natural environment leads to other programming models. The application of least-cost models is also discussed.
W69-04502

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
Joe B. Stevens.
Water Resources Research, Vol 2, No 2, 1966, pp 167-182.

Descriptors: *Benefits, *Recreation, *Sport fishing, *Water pollution control, *Estimating, Recreation demand, Elasticity of demand, Control, Demand, Toxicity, Thermal pollution, Water pollution, Dissolved oxygen, Water pollution effects, Model studies, Fishing, Water sports.

A methodology for estimating direct recreational benefits from water pollution control was developed through a model of biological and behavioral relationships involved in sports angling. A biological production function was envisaged between inputs of angling effort and the output, or yield, of fish taken. The marginal product, angling success per unit of effort, was taken to represent the 'quality' of the recreational experience. Water pollution would cause deteriorations in dissolved oxygen, temperature, or toxicity characteristics of the water, thus shifting the production function downward and causing reductions in angling success, angling effort, and recreational value of the fishery. Demand equations and 'success-effort' elasticities were estimated for three estuarial sports fisheries, and the methodology was illustrated by means of an assumed reduction in angling success. The direct recreational benefits were identified as the consumer surplus that would result from the prevention of water pollution.
W69-04504

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
R. V. Thomann.
Water Resources Research, Vol 1, No 3, 1965, pp 349-359.

Descriptors: *Mathematical models, *Water pollution control, *Systems analysis, *Delaware, *Dissolved oxygen, Mathematical studies, Model studies, Reaeration, Computers, Costs, Control, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions.

The basic concepts of systems analysis and optimum (least-cost) water pollution control are presented. The equations utilized to describe the time and space variability of dissolved oxygen are presented in a systems analysis context, and their usefulness in this form is discussed. The application of the mathematical model to the control of dissolved oxygen in the Delaware Estuary is given. Recent computer solutions are illustrated, and the sensitivity of the least-cost dissolved-oxygen improvement solutions to the rate of atmosphere reaeration is presented.
W69-04509

WATER POLLUTION CONTROL FACTS.
Report, Federal Water Pollution Control Federation, Washington, D. C., 1965.

Descriptors: *Water pollution control, *Statistics, *Municipal wastes, *Sewers, *Estimated costs, Waste water treatment, Sewage treatment, Industrial wastes, Data collections, Wastes, Conduits, Conveyance structures, Engineering structures, Hydraulic structures, Control, Waste treatment, Planning, Costs, Construction.

This report discusses various pertinent statistical data regarding pollution control requirements and costs, drawn from various publicly available publications. The content is indicated by the following table headings: New Sewer and Water Construction Put in Place in the United States, 1963, 1964, and Outlook for 1965; Construction Needs for Sewerage Utilities, Public and Private, 1962-70; Estimated Costs for Complete Separation of Stormwater and Sanitary Sewers; Estimated Costs for Partial Separation of Stormwater and Sanitary Sewers; Summary of the Backlog of Municipal Wastewater Treatment Needs, 1964; Present Municipal Wastewater Treatment Needs; Required Annual Construction Rates, Municipal Wastewater Treatment Works; Increase in Organic Industrial Wastes (Industrial); 1959 Operating and Replacement Costs for Industry Wastewater Treatment Facilities; Industrial Plants Providing No Treatment in 1959; Treatment Processes Most Frequently Mentioned by 2,162 Respondents; Water Plans; and 1959 Capital Expenditures for Construction of Wastewater Collection and Treatment Systems by Percent and Dollar Distribution.
W69-04515

WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
Water Pollution Control Federation, Journal, Vol 37, No 3, March, 1965, pp 292-315.

Descriptors: *Water quality, *Standards, *Quality control, *Streams, Effluents, Control, Bodies of water, Running waters.

A series of papers giving their authors' views relating to the subject. The papers and authors are as follows: 'Industry Views', by Harold L. Jacobs; 'Conservation View', by Ira N. Gabrielson; 'An Index-Number System for Rating Water Quality', by Robert K. Horton; 'Some Thoughts About Effluent Standards', by Walter A. Lyon; 'Stream Standards', by Earle C. Hubbard; and 'Water Quality Criteria Development', by Gordon E. McCallum.
W69-04516

LINDANE ADSORPTION BY LAKE SEDIMENTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
Erik G. Lotse, Donald A. Graetz, Gordon Chesters, Gerhard B. Lee, and Leo W. Newland.
Environ Sci Technol, Vol 2, No 5, pp 353-357, May 1968. 4 fig, 2 tab, 12 ref.

Descriptors: *Adsorption, *Insecticides, *Sediments, *Lakes, Analytical techniques, Carbon isotopes, Chlorinated hydrocarbon pesticides, Correlation analysis, Digital computers, Halogenated pesticides, Hydrogen bonding, Insecticides, Pesticide kinetics, Pesticide residues, Pesticides, Radiochemical analysis, Regression analysis, Statistical methods, Water pollution effects, Water pollution sources, Water quality, Wisconsin.
Identifiers: *Lindane, Freundlich equation, Langmuir equation, Van der Waal's forces, Vilas County (Wis), Oneida County (Wis), Multiple correlation analysis.

Authors investigated the sorptive properties of eight lacustrine sediments for lindane (gamma-benzene hexachloride) by equilibrating aqueously the dissolved insecticide, uniformly labelled with radiocarbon, with sediments for 24 hours at 23 deg C, then determining residual aqueous-phase radioactivity with scintillation spectrometer. Diverse compositional characteristics of oven-dried sediments comprised the following percentage ranges: sand (greater than 50 microns diame-

ter), 1.6-87.5%; silt (2-50 microns), 5.1-27.5%; total clay (smaller than 2 microns), 4.0-36.4%; organic matter, 3.0-64.2%. Lindane adsorption (y) could be defined by the following regression equation, which accounts for 84% of its variation: $y = 0.063 + 0.093L - 0.013S + 0.034R + 0.0034M + 0.0058C$, where L = lindane concentration; S = sediment concentration; R = ratio, lindane:sediment (micrograms/milligram); M = organic matter; and C = clay content. Insecticidal adsorptions fit Freundlich equation, R = (k) (c-to-power-n), where c = equilibrium concentration of lindane, and where constant k = 0.295, 0.302, 0.331, 0.331, 0.339, 0.437 and n = 0.92, 0.89, 0.92, 0.86, 0.75, 0.76 when R = 0.1, 0.2, 0.5, 1.0, 2.0, 5.0. Probably because of its low solubility lindane adsorption did not fit the Langmuir equation. Because lindane is neutral and does not ionize, van der Waal's forces and hydrogen bonding constitute most feasible adsorptive mechanisms. (Eichhorn-Wis)
W69-04525

MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS,
Resources for the Future, Inc., Washington, D. C.
Allen V. Kneese, and Blair T. Bower.
Baltimore, Maryland, The Johns Hopkins Press, 1968. 328 p, 46 fig, 16 tab.

Descriptors: *Water resources development, *Administration, *Water quality control, *Planning, *Water management (Applied), Watershed management, Governments, Institutions, Industries, Economics, Impaired water quality, Cost analysis, Multiple-purpose projects, Systems analysis.
Identifiers: Water quality planning, Water quality management.

Water quality is discussed in terms of the causes of degraded quality and the means of preventing and correcting poor conditions by the use of proper water management, resource planning, and public policy. The economic theaory of resources allocation is illustrated by a number of case studies of actual situations. Quality standards are discussed in recognition of the difficulty of assigning economic costs and value to esthetic and other intangible environmental and human emotional values. Regional water quality management is treated by considering economies of scale in both water control and effluent treatment. In some cases, individual industrial treatment may be uneconomical, and co-operative or governmental regional collection and treatment of discharges in central plants is possible. The interrelation of all elements of the hydrologic cycle in quality control is stressed. (Knapp-USGS)
W69-04578

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
Corps of Engineers, Philadelphia, Pa. Operations Div.
For primary bibliographic entry see Field 02L.
W69-04581

FLOOD AND POLLUTION CONTROL: A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 04A.
W69-04630

CHICAGO TUNNEL DRAINAGE PROJECT: PRELIMINARY EVALUATION OF FEASIBILITY.
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 04A.
W69-04631

ALLOCATION AND REALLOCATION OF WATER RESOURCES,
American Water Works Association, New York.
Elmo R. Morgan.
Am Water Works Ass'n J, Vol 61, No 1, pp 17-19, Jan 1969. 3 p.

Descriptors: *Water quality control, *Reservoir storage, *Water policy, *Water pollution control, Reservoirs, Storage, Multiple-purpose reservoirs, Multiple-purpose projects, Water supply, Water pollution, Water pollution control, Regulated flow, Flow control, Streamflow, Water projects.

Allocation of storage space and water in federal reservoir projects for water quality control is under study. The Department of Interior is charged with administering section 3 (b) of the Federal Water Pollution Control Act dealing with reservoir storage for quality control and streamflow regulation. The Bureau of the Budget and the Water Resources Council are formulating a national policy of water quality control, including the application of section 3 (b). Section 3 (b) must be administered in light of the national attitude toward water quality and pollution expressed in legislation, executive orders, and new state water standards. Water quality goals can be obtained through pollution control coupled with maintaining quality standards at source, including use of reservoir storage under section 3 (b). Legal power and legal mechanisms are necessary to insure effective and prudent operation of the reservoir projects. Water quality control is not a beneficial use in some states, and studies considering possible changes in the law of these states should be made. A reasonable period of time must be allowed to assess project benefits and costs. There would be a 50-50 cost sharing between the local sponsor and the government, and alternative methods should be given equal financial status. (Helwig-Fla)
W69-04647

THROWING GAS TAR OR REFUSE INTO PUBLIC WATERS AND WILLFULLY POISONING FOOD.
N Y Penal Law secs 1759, 1760 (McKinney 1968).

Descriptors: *New York, *Water pollution, *Poisons, Legislation, Public rights, State governments, Wastes, Pollutants, Toxins, Water pollution control, Sewers, Streams, Reservoirs, Wells, Springs, Legal aspects.
Identifiers: Penalties (Criminal).

Anyone who throws or deposits gas, tar, refuse or any other noxious, offensive or poisonous substance into any public waters, or any sewer or stream running into any public waters, or any sewer or stream running into such public waters, is guilty of a misdemeanor. Anyone who willfully poisons any spring, well or reservoir of water is punishable by imprisonment up to ten years in a state prison, or up to one year in a county jail, or by a fine not exceeding five hundred dollars, or both such fine and imprisonment. (Scott-Fla)
W69-04659

DEPARTMENT OF HEALTH V PASSAIC VALLEY SEWERAGE COMMISSION (DEPARTMENT OF HEALTH'S AUTHORITY OF DISCHARGE OF SEWERAGE).

100 N J Super 540, 212 A 2d 675-684 (1968).

Descriptors: *New Jersey, *Judicial decisions, *Sewage, *Water pollution control, Water pollution, Water pollution treatment, Water quality control, Water treatment, Wastes, Public health, Legislation, Municipal wastes, Disposal, Sewage effluents, Waste water disposal, State jurisdiction, Legal aspects.
Identifiers: Injunctions (Prohibitory).

Plaintiff ordered defendant to improve its sewage treatment facilities so that its effluent, pumped through an outfall line into Upper New York Bay, would be less harmful to New Jersey waters. Plaintiff then sued for summary injunctive relief. The defendant contended that plaintiff had no jurisdiction over it or its treatment and pumping plant. Plaintiff asserted that it had jurisdiction under several New Jersey statutes. The court discussed these statutes and applicable federal legislation on water pollution. The court directed defendant to comply with plaintiff's directive which required that defendant cease the discharge of improperly and insufficiently treated sewage. The court concluded that it was for plaintiff to determine what action should be taken under the exigencies of the situation. (Heckerling-Fla)
W69-04664

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).

216 So 2d 78-80 (4th DCA Fla 1968).

Descriptors: *Florida, *Water pollution, *Swimming pools, *Atlantic Ocean, Judicial decisions, Legal aspects, Cities, Pollution abatement, Domestic wastes, Discharge lines, Pollutants, Seepage.
Identifiers: Injunctions (Temporary), Injunctions (Prohibitory), Standing, Injunctions (Mandatory).

Defendant hotel operator maintained a swimming pool having a discharge line used to drain the pool water in the Atlantic Ocean. A break in the line at the point where it entered the ocean emitted seepage which, when sampled, indicated contamination by human or animal waste. Defendant corrected this condition by sealing off a lateral line which carried septic waste into the discharge line and, in the process of repair, sealed the break in the line, thus preventing plaintiff from conducting additional tests. Plaintiff sought to temporarily enjoin defendant from discharging the pollutants into the ocean. The court held that, although it need not be shown by clear, certain, and convincing evidence that irreparable injury will result in order for the injunction to issue, plaintiff had failed to prove that the contamination continued after the repairs were made. The plaintiff had no standing to bring the suit since the Florida Statutes give exclusive authority to seek such an injunction to the State Board of Health. (Molica-Fla)
W69-04668

BOROUGH OF WESTVILLE V WHITNEY HOME BUILDERS (SEWAGE EFFLUENTS FLOWING INTO CITY RECREATION AREA LAKE).

40 N J Super 62, 122 A 2d 233-245 (Super Ct App Div 1956).

Descriptors: *New Jersey, *Riparian rights, *Reasonable use, *Sewage disposal, Natural flow doctrine, competing uses, Water pollution, Recreation, Judicial decisions, Sewage effluents, Sewage, Sewage bacteria, E coli, Sewage treatment, Waste water disposal, Sludge disposal, Social needs, Community development, Surface waters, Ponds, Streams, Administrative agencies, Legal aspects.

Plaintiff municipality asked the court to enjoin the operation of a sewage disposal plant on the border outside of the municipality. The defendant secured the approval of the town in which the plant was located to build the plant, which was to serve 300 houses. The liquid effluent discharged by the plant flowed into a small natural stream which emptied into a pond situated in plaintiff's principal park. The plaintiff contends that it has a right to have the pond remain uncontaminated and unpolluted by the discharge of effluent and that the discharge creates a public nuisance and is productive of a hazard to the public health. The court alluded to the reasonable use doctrine under which there must be fair participation in common waters of those who have a right of property therein on the basis of what all the attendant circumstances shows to be reasonable. Finding the evidence of pollution inconclusive, the court held that the balance of uses and harms reflected by the evidence did not necessitate the issuance of an injunction. The court also inferred that mere approval by a state adminis-

trative agency would not preclude judicial relief to a riparian owner where the facts and circumstances indicate that such relief should be granted; as in this case. (Heckerling-Fla)
W69-04677

RANDALL V CLIFFORD (POLLUTION AND DESTRUCTION OF WATER SUPPLY).
122 A 2d 833-840 (Vt 1956).

Descriptors: *Vermont, *Springs, *Water pollution, *Drainage systems, Drainage practices, Ditches, Surface runoff, Runoff, Diseases, Soil contamination effects, Reasonable use, Streams, Legal aspects, Damages, Domestic water.
Identifiers: Easements by reservation, Statute of frauds, Standing.

Plaintiff conveyed a portion of his land upon which were located 2 springs supplying water for domestic use. The deed reserved to the plaintiff the right to build water lines across the property, if necessary, but did not reserve title to or rights to use of the springs. Plaintiff continued openly to use the springs. Defendant purchased the land from plaintiff's grantee, and defendant knew of and acquiesced in plaintiff's use of the springs. Defendant built a drainage ditch which caused destruction of the springs and damage to plaintiff's dooryard. Defendant also negligently disposed of a dead heifer in a manner which caused pollution of plaintiff's water supply and resulted in illness. The court held that, in order to have standing to sue for damage to the spring, Plaintiff had the burden of affirmatively demonstrating his retention of title. The deed did not reserve title, and he could not introduce parol evidence to show the parties subjectively intended that he retain title. This would vary the terms of the written instrument, contrary to the statute of frauds. Plaintiff could recover for damage to his dooryard. Since defendant knew the dead heifer would pollute plaintiff's water supply, the act was fundamentally tortious. (Helwig-Fla)
W69-04678

BURR V ADAM EIDEMILLER, INC (SUBSURFACE POLLUTION OF WATER SUPPLY).

386 Pa 416, 126 A 2d 403-408 (Pa 1956).

Descriptors: *Pennsylvania, *Subsurface drainage, *Subsurface runoff, *Water pollution, Damages, Runoff, Leaching, Springs, Acidity, Drainage water, Corrosion, Water pollution effects, Reasonable use, Natural use, Legal aspects, Domestic water.
Identifiers: Non-trespassory invasion.

Plaintiff brought suit for damages from subsurface contamination of water supply. A spring was the prime source of water for a residential area, rental cottages, and an artificial lake. Defendant had a temporary road construction site adjacent to plaintiff's property where he leached slag by spraying large amounts of water over it. The runoff entered the water supply from the spring causing an acid condition; this resulted in damage to plumbing and contamination of the lake. Plaintiff informed defendant of the contamination, but this resulted in no appreciable reduction in activities. The court ruled that in a non-trespassory invasion action, if the invasion is intentional, the conduct need only be unreasonable; not negligent or reckless. Since defendant knew of the contamination and failed to cease, his actions must be classed as 'intentional.' Upon the facts the jury would find his conduct unreasonable. The court also found that since the area was residential, defendant's activity was unnatural use of the land; this 'unnatural' use had bearing on the reasonableness of defendant's conduct. (Helwig-Fla)
W69-04681

DEPARTMENT OF WATER AND AIR RESOURCES: ORGANIZATION AND POWERS GENERALLY; CONTROL OF POLLUTION.

N C Gen Stat secs 143-211, 212, 214.1, 215.1 to 215.3, 215.5 to 215.8 (1967 Supp).

Descriptors: *North Carolina, *Permits, *Water conservation, *Standards, Legislation, Administrative agencies, Classification, Water pollution, Water quality, Water quality control, Administration, Watersheds (Basins), Bodies of water, Pollution abatement, Adjudication procedure, Legal aspects, Regulation.

Water quality control and conservation is declared to be of the highest priority. The Department of Water and Air Resources is created. The Board of Water and Air Resources is directed to develop, adopt and assign classifications to all waters of the state, and to develop standards applicable thereto. Criteria for classifications and standards are set out. The character of the water and the surrounding land and the nature of past, present, and future uses are to be taken into account when assigning classifications. Notice and hearing procedures are set out. Board permits are required for any new potential sources of water pollution. Procedures for issuing and revoking such permits are set out. No person shall discharge any pollutants into the waters of the state, and the Board may issue special orders requiring pollution abatement. Requirements for voluntary projects are listed. The Board may modify and revoke regulations, investigate infractions, and hold public hearings. Judicial review of Board determinations is provided for, and penalties for violations of the act are established. The act does not cover public water supplies and sanitary disposal of sewage. (Williams-Fla)
W69-04687

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

A DISSIPATIVE RIVER FLOW MODEL,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W69-04232

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois State Water Survey, Peoria; and Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 05C.
W69-04247

USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05B.
W69-04277

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05D.
W69-04281

THE FUTURE OF AN ESTUARY,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05G.
W69-04290

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 02L.
W69-04291

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05B.
W69-04311

DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
For primary bibliographic entry see Field 06G.
W69-04312

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05G.
W69-04315

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05B.
W69-04329

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
For primary bibliographic entry see Field 05G.
W69-04502

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
For primary bibliographic entry see Field 05G.
W69-04509

METROPOLITAN PLANNING AND RIVER BASIN PLANNING: SOME INTERRELATIONSHIPS,
Georgia Inst. of Tech., Atlanta. School of Architecture.
Guy J. Kelnhofer, Jr.
Water Resources Center Rep WRC-0268, Georgia Inst Tech, July 1968. 218 p, 13 fig, 6 tab, 229 ref. OWRR 14-01-0001-874, OWRR B-009-GA. Res for report supported by matching funds from OWRR, Dept of Interior and Georgia Inst Tech.

Descriptors: *Water resources development, *Planning, *Urbanization, *River basin development, *Georgia, Colorado, Ohio, Ohio River, Arkansas, Minnesota, Mississippi River, Nebraska, Long-term planning, Water supply.
Identifiers: *Atlanta, *Chattahoochee River basin, Cincinnati, Little Rock, Minneapolis, St. Paul, Omaha, South Platte River, Arkansas River.

Based on help from 25 leading people in Atlanta, visits to Denver, Omaha, Minneapolis, St. Paul and Cincinnati, and literature research, metropolitan residents are found to be unconcerned about the development of their water resources. This attitude is caused by rivers generally being inaccessible and hidden from view of the public, by their history of being exploited for their economic value, and lack of public awareness of the value of rivers. Floods evoke much unfortunately ephemeral public concern and readiness to act. Public concern about the genuine need for river development projects is often 'bought off' by the preponderance of Federal money. The agency that should best represent a metropolitan community in water planning is the metropolitan planning commission. Where the state has supplied no intermediary mechanism to represent the local government, Federal and local agencies will cooperate to solve their mutual problems. Data on Atlanta's planning include longitudinal profile of the Chattahoochee River with existing and proposed reservoirs, waste disposal and water supply in Metropolitan Atlanta, water diversion in Metropolitan Atlanta from Chattahoochee to Flint and South River basins, and proposed Newnan Reservoir at maximum design pool in Atlanta area. Tables give hydroelectric

plants on the Chattahoochee River with their total capacity of 521,200 kw, observed coliform concentrations ranging from 4,900 to 3,300,000 in June and July, 1965 on the Chattahoochee River from 3 mi above to 41 mi below Clayton, Chattahoochee River frontage in Georgia from Buford Dam to Whitesburg owned by public and quasi-public agencies, and uses of Chattahoochee River frontage by local government from Buford Dam to Whitesburg, Ga. (Vorhis-USGS)
W69-04566

6B. Evaluation Process

THE BUFFALO SCENIC RIVERWAY.
Tennessee Valley Authority, Knoxville. Div. of Reservoir Properties.

TVA Report, September 1968. 18 p.

Descriptors: *Scenery, *Aesthetics, Wild rivers, Wild Rivers Act, Recreation, Rivers, Streams, Stream fisheries, Tennessee River.
Identifiers: Buffalo River, Tennessee.

The Tennessee Valley Authority and the State of Tennessee, with participation by the National Park Service, has proposed to undertake a demonstration in scenic riverway development of the Buffalo River in middle Tennessee to show how a balanced development of a river for public use and enjoyment might be achieved while protecting the natural features which account for its attractiveness. The riverway project will consist of two stages. Stage I, which includes the upper half of the river--about 60 miles in length--will require four years to complete. By the end of this initial development period, there will exist a workable and manageable unit of the demonstration. State II will be undertaken on the lower 60 miles of the river upon completion of State I. Cost of this project will be shared by TVA and the State of Tennessee. The National Park Service, as part of their development plan for the Natchez Trace Parkway, will participate in the planning and construction of facilities at the Natchez Trace crossing of the Buffalo River. (Taylor-TVA)
W69-04201

FUTURE DEVELOPMENT OF THE GROUNDWATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W69-04206

FRESH WATER,
Mid-Cheshire Water Board (England).
For primary bibliographic entry see Field 03B.
W69-04225

MAN AND THE ESTUARY.

Conservation Foundation Letter, April 22, 1968, pp 8-11.

Descriptors: *Costs, *Benefits, *Economic efficiency, Water pollution effects, Dredging.

The economic benefits and uses of the estuary are listed. The article maintains that the benefits of estuaries are fairly easy to measure, but the economic losses from abuses of this resource are harder to assess. Some data on economic losses from dredging, filling, and pollution of estuaries are given.
W69-04283

A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
J. H. Manning.
Maryland Department of Chesapeake Bay Affairs, Annapolis, 1967.

Descriptors: *Commercial fishing, *Commercial shellfish, *Fish harvest, *Market value, *Maryland, Oysters, Animals, Aquatic animals, Aquatic life, Invertebrates, Shellfish, Benthic fauna, Benthos, Marine animals, Mollusks, Value, Income, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Employment.

This document reports the values of Maryland's commercial fisheries from 1957 through 1966. The landed value of Maryland's commercial fisheries products reached an all-time high of $14,012,000 in 1966, with oysters accounting for 56 percent. The value of Maryland's manufactured fisheries products reached $39,000,000 in 1966. Data are provided on the number of people employed in the fisheries industry. Maryland now leads the U. S. in oyster production and can be expected to do so for several years.
W69-04284

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
Committee on Public Works (U. S. Senate).
For primary bibliographic entry see Field 05B.
W69-04293

MEASURING THE IMPACT OF THE WATERBORNE COMMERCE OF THE PORTS OF VIRGINIA ON EMPLOYMENT, WAGES, AND OTHER KEY INDICES OF THE VIRGINIA ECONOMY, 1953-1965.

Bureau of Population and Economic Research Report, University of Virginia, Charlottesville, January, 1967.

Descriptors: *Harbors, *Virginia, *Economic impact, Employment, Wages, Taxes, Transportation, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., Industries.

This study is concerned with measuring the effects of selected economic components resulting from, and generated by, the waterborne commerce that flows through the ports of Virginia. The economic components used are employment, wages, state and local taxes, business and industrial activities. Because most of the port activity in Virginia occurs in the ports of Hampton Roads, the findings of this study were based primarily on the waterborne commerce at Hampton Roads. This report is the twelfth of a series undertaken by the University of Virginia for the Virginia State Ports Authority and published annually since 1957.
W69-04295

FISH PROTEIN CONCENTR)TE SEEN POSSIBLE NEW INDUSTRY,
C. L. Mitchell.
Fisheries of Canada, Vol. 19, No. 11, May, 1967, pp 12-15.

Descriptors: *Commercial fishing, *Proteins, *Fish handling facilities, *Operating costs, *Foods, Fish management, Fisheries, Production costs, Fishing, Industries, Facilities, Management, Pricing, Competitive prices, Prices, Competition, Marketing, Industrial production, Costs, Foreign countries, Geographical regions, Regions.

The author states that a fish protein concentrate industry in both Canada and the U. S. will develop shortly. Canada will be able to compete favorably with the U. S. in marketing FPC because it is estimated that the market prices of FPC in Canada and the U. S. will be $300/ton and $400/ton, respectively. FPC production costs are itemized.
W69-04299

IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
C. Mock.
11th International Game Fish Conference (1966), Proceedings, August, 1967, pp 66-68.

Descriptors: *Value, *Gulf of Mexico, *Commercial fishing, *Sport fishing, *Water pollution, *Urbanization, Estuarine fisheries, Recreation, Gulfs, Fish, Central U. S., Commercial fish, Commercial shellfish, Texas, Aquatic habitat, Environment, Tidal effects, Coastal plains, Geographical regions, Mollusks, Benthic fauna, Benthos, Marine animals, Oysters, Fisheries, Fishing, Industries, Animals, Aquatic animals, Aquatic life, Invertebrates, Shellfish, Water sports, Bodies of water, Surface waters, Resources, Wildlife, Gulf coastal plain, Regions, Southwest U. S.

The author states that the value of the sport fisherman to the American economic system probably exceeds that of the commercial fishery, and will in the future. It is estimated that the renewable fishery resources of Gulf coastal waters yield 1/2 billion pounds of fish and shellfish; 90 percent of this is from five estuarine-dependent species. The author argues that industrial and urban development in Texas will have or has had four major effects on estuaries: (1) Direct alteration or destruction of habitat; (2) Reduction of tidal exchange between Gulf and estuary; (3) Past or possible future depletion of fresh water to the bay oyster; (4) Continuing deterioration of water quality through pollution. The author feels that the future of the Texas estuary appears to be an escalation of these problems.
W69-04300

RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
F. Moss.
11th International Game Fish Conference (1966), Proceedings, August, 1967, pp 69-74.

Descriptors: *Sport fishing, *Commercial fishing, *Income, *Size, *Competition, Recreation, Fishing, Water sports, Industries.

The author states that sport fishing should be considered an industry by virtue of its dollar value, number of participants, and size of catch. Some of the conflicts between sport and commercial fishermen are discussed and some solutions are suggested.
W69-04302

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
Jeff W. Napier.
In CLEAN WATER FOR THE NATION'S ESTUARIES, Transcript of Public Meeting, Biloxi, Mississippi, January 17, 1968, pp 22-30.

Descriptors: *Recreation, *Boating, *Recreation wastes, *Sport fishing, *Water pollution, Water quality, Recreation facilities, Wastes, Water sports, Sport fish, Animals, Aquatic animals, Aquatic life, Fish, Wildlife.

Estuaries are highly suitable areas for pleasure boating for several reasons, including: accessibility to urban areas and historical sight-seeing value. Estuaries also provide sheltered waters and a variety of fish species. An estimated 40 million people go boating every year, and boat owners are estimated to spend about $3 billion annually. Boating has been growing at an annual rate of more than five percent. Napier contends that sewage from pleasure boats is a highly negligible source of pollution, particularly in comparison to particular industrial plants.
W69-04303

OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
Hayden Stone Investment Research Department, October, 1967.

Descriptors: *Oil industry, *Desalination, *Oceanography, *Economic prediction, *Commercial fishing, Mining, Fishing, Oceans, Bodies of water, Surface waters, Industries, Exploitation, Oil fields, Forecasting, Demineralization, Separation techniques, Water purification, Water treatment, Oil reservoirs.

Present markets in the oceanography field and their future projections (1977) are described. In-depth analysis is made of offshore petroleum field and its related companies.
W69-04305

MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
L. Pincus, J. C. Thomas, and J. A. Hansen.
California Fish and Game, Vol 53, No 2, 1967, pp 88-104.

Descriptors: *Sport fishing, *Piers, *Jetties, *California, Recreation, Fishing, Water sports, Engineering structures, Coastal structures, Geographical regions, Pacific coast region, Regions, Southwest U. S., Statistics, Data collections.

The authors supply statistics on the number of people using piers and jetties for recreational fishing. Since a considerable number of people are using these piers and jetties, it is recommended that pier-development programs be continued.
W69-04316

PLAN DEVELOPING FOR UNDERWATER PARKS.
Parks and Recreation, Vol 3, No 9, September, 1968, pp 11-12.

Descriptors: *Underwater, *Parks, *California, Recreation, Surveys, Aquatic environment, Shores, Scuba diving, Water sports, Environment, Geographical regions, Pacific coast region, Regions, Southwest U. S., Coasts, Coastal areas, Coastlines.

A survey is being conducted along the coast of California to investigate its resources, geological features, and the destruction of animal life in the tidal pools. The survey is part of a plan to create a series of underwater parks in the state. Underwater sports and marine science will be stressed.
W69-04317

WORLD OFFSHORE RIG FLEET TO BALLOON AGAIN IN 1968,
Leslie C. Rogers.
Oil and Gas Journal, Vol 66, No 1, January 1, 1968, pp 29-30.

Descriptors: *Oil industry, *Drilling, *Offshore platforms, Industries, Engineering structures, Hydraulic structures, Structures, Exploration, Gulf of Mexico, Bodies of water, Gulfs, Surface waters, Forecasting.

The author discusses future expansion of offshore oil rig construction. Also, the author tabulates present oil rig construction around the world and present idle rigs in the Gulf Coast.
W69-04328

ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
Niels Rorholm, H. C. Lampe, Nelson Marshall, and J. F. Farrell.
Report of Rhode Island Univ., Agricultural Experiment Station, Department of Food and Resources Economics, Kingston, Rhode Island, Bulletin No. 396, 1967.

Descriptors: *Economic impact, *Estuarine environment, *Industries, *New England, Geographical regions, Regions, Northeast U. S.

The primary purpose of this report is to analyze the economic impact of those commercial enterprises that depend upon the near-ocean and the near-shore environment for their existence in given locations. The Southern New England Marine Region was selected as the study area. Chapter I describes the framework within which the marine industries operate. Chapters II and III deal with the marine industries themselves, first by way of description and subsequently in an input-output framework to facilitate a comprehensive economic impact evaluation. Chapter IV brings into consideration certain non-economic variables, and in Chapter V is discussed the growth of marine industries and the possible application of this work to other regions.
W69-04330

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
Stanford Univ., Calif.
For primary bibliographic entry see Field 05G.
W69-04331

SEAFARING EMPLOYMENT.

Division of Labor Studies, Office of Maritime Manpower, Washington, D. C., February 20, 1967.

Descriptors: *Manpower, *Ships, Transportation.

This is a table showing the number of jobs, by type of ship, aboard ocean-going U. S. flag merchant ships of 1000 gross tons or over from 1947.
W69-04336

THE SEAFOOD INDUSTRY, A LOCAL ANALYSIS.
City Planning Commission, Hampton, Virginia, November, 1967.

Descriptors: *Virginia, *Commercial fishing, *Commercial shellfish, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., Employment, Shellfish, Animals, Aquatic animals, Aquatic life, Invertebrates.

The seafood industry of Hampton, Virginia, is compared by percentages with the industry (1) in the Chesapeake Bay area, (2) on the East Coast, and (3) in the United States. Tables indicating the volume and value of the various following components in the industry are given: (1) seafood production volume, (2) value of industry, (3) employment data, and (4) seafood landings volume.
W69-04337

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
Howard J. Sears.
In CLEAN WATER FOR THE NATION'S ESTUARIES, Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, February 29, 1968, pp 43-45.

Descriptors: *Fish handling facilities, *Commercial shellfish, *Georgia, *Economic impact, Environment, Habitats, Facilities, Outdoor recreation, Labor, Water pollution, Employment, Recreation facilities, Water pollution effects, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Regions, Southeast U. S., Animals, Aquatic animals, Aquatic life, Invertebrates, Shellfish.

There are more than 95,000 acres of estuarine area within Glynn County, Georgia. These acres are important nursery grounds and habitats for shellfish, which provide an annual catch of 100 million pounds. The local seafood processing industry employs 1/3 of the area's manufacturing workers, including 85 percent of the local females employed in manufacturing. This industry as well as the estuarine-oriented recreation industry is being threatened by pollution.
W69-04338

ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
William N. Shaw.
Report, Gulf and Caribbean Fisheries Institute, 19th Annual Session, Proceedings, Septebmer, 1967, pp 108-115.

Descriptors: *Oysters, *Fish farming, *Cultural control, *Productivity, Commercial shellfish, Animals, Aquatic animals, Aquatic life, Benthic fauna, Benthos, Invertebrates, Marine animals, Mollusks, Shellfish, Agriculture, Control, Maryland, Virginia, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Southeast U. S., Bays, Bodies of water.

The author gives a review of the research in off-bottom culture of oysters. He feels that the present decline in the oyster industry along the East Coast can only be offset by such techniques, and that one of the most significant reasons for a failing industry in the Chesapeake Bay region is the lack of private farming. It is also stated that the difficulty of obtaining exclusive use of oyster lands in the Maryland portion of the Chesapeake has prevented the development of private oyster farming.
W69-04339

SUMMARY ECONOMIC BASE STUDY CHESAPEAKE BAY DRAINAGE BASINS.
National Planning Association, Center for Economic Projections, Washington, D. C., Report No. 1409, February, 1967.

Descriptors: *Regional analysis, *Watersheds (Basins), *Economic prediction, Employment, Maryland, Virginia, District of Columbia, River basins, Industries, Community development, Data collections, Occupations, Atlantic coastal plain, Forecasting, Regions, Analysis, Appalachian Mountain region, Coastal plains, Geographical regions, Northwest U. S., Southeast U. S., Cities, Statistics.

This report highlights the analyses and major qualitative results of the Chesapeake Bay Drainage Basin Study. The study is divided into 18 economic subregions for which individual economic profiles are given. Four of these subregions are relevant to the Chesapeake Bay estuary: Subregion 8: Baltimore; Subregion 9: Peninsula (Maryland, E. Shore); Subregion 13: Washington; and Subregion 18: Norfolk. Employment data and projections are given by subregions, as are manufacturing employment data and projections. There are no data particularly pertinent to the economic activity of the estuary itself except, perhaps, the manufacture of transportation equipment. Tables are given by subregion for: (1) Cumulative population growth; (2) Per capita income; and (3) Export and residentiary employment covering the year 1960 with 10-year projections from 1970 to 1990.
W69-04346

TECHNOLOGY ADDING BILLIONS TO RESERVES.
Oil and Gas Journal, Vol 66, No 3, January 15, 1968, pp 51-53.

Descriptors: *Oil industry, *Technology, *Cost analysis, Oil reservoirs, Industries, Drilling, Transportation, Analysis, Mathematical studies.

The author discusses the gains in technology which save consumers billions of dollars and will add billions of barrels to oil reserves through the 1970's. What technology has achieved since World War II: Drilling cost - Pared $7/foot; Produced crude cost - Slashed $1/bbl.; Oil-recovery rate - Improved 13 percent; Oil-transportation cost - Reduced 50 percent; and Refinery - operating cost - Lowered 12 percent.

W69-04348

A CALL FOR ACTION,
Russell E. Train.
Conservation Foundation Letter, April 22, 1968, p 12.

Descriptors: *Legislation, *Cost-benefit ratio, *Planning, *Environmental effects, *Estuarine environment, Conservation, Aquatic environment, Governments, Federal government.

A program for estuarine preservation is proposed: (1) Every coastal state should declare a moratorium on tampering with major estuaries and at the same time create conservation and development commissions to study each estuary, prepare a plan for the estuary, and present the alternatives to the people and governments involved. (2) Conservation and environmental values in general should be included in determining if permits shall be issued for dredging and filling. (3) A national inventory of estuaries should be included in a system of protected estuaries. (4) Customary techniques of computing cost-benefit ratios should be reassessed. We do not yet know how to determine and assign values to the intangibles of a quality environment. We remain at the mercy of development accounting, which measures costs against benefits without including the cost of degrading the environment alone. Such a reassessment would be a logical assignment for a Presidential Council of Environmental Advisors; but, lacking such a council, the assignment might well be given to a special Presidential task force.
W69-04352

PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
Lionel Walford.
32nd North American Wildlife and Natural Resources Conference, Transactions, March 13-15, 1967, pp 161-164.

Descriptors: *Water resources development, *Governments, *Atlantic coastal plain, *Recreation facilities, Social aspects, Conservation, Resource development, Legislation, Recreation, Water sports, Outdoor recreation, Social impact, Local governments, State governments, Coastal plains, Geographical regions, Regions, Sport fishing, Fishing, Wildlife conservation.

The author says that the 'resort industry' of the Atlantic coastal lowlands has had a tendency towards self-destruction in its failure to recognize and nurture the resource base on which it rests. The vast population which inhabits the Atlantic estuarine zone tends to associate itself with metropolitan rather than regional needs; therefore the responsibility of estuarine conservation rests on fragmented agencies within state and local government. If it is desired to conserve the quality of the environment in the Atlantic estuarine zone, the principal question is not how can states rights be preserved, but how can states work together in designing the uses of the zone so as to protect their common resources.
W69-04355

STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
Lionel Walford.
Estuarine Hearings, Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, House of Representatives, 90th Congress, Serial No. 90-3, March, 1967.

Descriptors: *Damages, *Wetlands, *Estuarine fisheries, *Commercial fishing, *Estuarine environment, *Atlantic Ocean, Value of estuary, Fisheries, Aquatic environment, Fishing, Fish, Industries, Commercial shellfish, Wildlife conservation, Coasts, Bodies of water, Oceans, Surface waters, Animals, Aquatic animals, Aquatic life, Invertebrates, Shellfish, Natural resources, Resources, Marine fish, Saline water fish, Wildlife, Conservation.

Most of the world's population is concentrated on the seacoasts. At the same time more than 90 percent of food fish live in coastal waters. The Atlantic estuary is exceptionally productive. Five cases are cited where the fishery resources have been damaged.
W69-04356

PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
M. H. Weil.
11th International Game Fish Conference (1966), Proceedings, August, 1967, pp 59-65.

Descriptors: *Sport fishing, *Texas, *Habitats, *Forecasting, Channel improvement, Dams, Soil conservation, Recreation, Fishing, Water sports, Central U. S., Coastal plains, Geographical regions, Gulf coastal plain, Regions, Southwest U. S., History, Environments, Conservation, Dredging.

The author states that sport fishing in Texas waters has improved and argues that it should continue to improve. The author feels that with more people fishing, plus changes in the ecology of the area such as the damming of rivers, soil conservation practices, channel dredging for industrial development, and increased boat traffic, fishing values are affected. He feels, however, that new habitat can be encouraged to replace the old areas which may become lost. Specific examples are cited.
W69-04362

WEST COAST OIL FUTURE IS BRIGHT.
Offshore, Vol 27, No 7, June 20, 1967, pp 70-74.

Descriptors: *Oil industry, *Oil fields, *Future planning (Projected), Oil reservoirs, Industries, Planning, Forecasting, Leases, Pacific coast region, Geographical regions, Regions.

The article discusses the future of West Coast oil fields. Also discussed are the future leasing potentials and bonuses.
W69-04363

MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
Arvid A. Anderson.
Bureau of Business Research, Texas Univ., Research Monograph No. 21, June, 1960.

Descriptors: *Water resources, *Value, *Texas, *Water values, Resources, Water sports, Sport fishing, Recreation, Natural gas, Mining, Commercial fishing, Waste water disposal, Transportation, Productivity, Aquatic productivity, Oil wells, Gases, Fishing, Industries, Waste disposal, Transportation, Bays, Bodies of water, Central U. S., Gulf coastal plain, Regions, Coastal plains, Geographical regions, Southwest U. S.

The report describes a study which developed estimates of dollar value per surface acre of the various economic uses of the bays in the Corpus Christi, Texas, area. Values estimated were for recreational uses, commercial fishing, oil production, natural gas production, mudshell production, industrial and municipal uses of bay water including waste assimilation, and savings resulting from shipping goods by water rather than land. A detailed summary of value estimates is given in tabular form.
W69-04436

'NATURAL RESOURCES AND THE QUALITY OF LIFE',
Harold J. Barnett, and Chandler Morse.
In READINGS IN RESOURCE MANAGEMENT AND CONSERVATION, pp 585-594. University of Chicago Press, Chicago, Illinois, 1965.

Descriptors: *Resource allocation, *Social values, *Natural resources, *Competition, Water resources development, Values, Resources, Resource development.

Barnett and Chandler discuss the social problems which have arisen in relation to the use of natural resources, e.g. whether a community has pre-emptive rights to exploit a resource irrespective of the rights of other communities to the same resource. It was concluded that it would be advisable to apply a more objective methodology to the natural-resource value problems.
W69-04440

THE CALIFORNIA OYSTER INDUSTRY,
Elinore M. Barrett.
Resources Agency of California, Department of Fish and Game, Sacramento, California, Fisheries Bulletin No. 123, 1963.

Descriptors: *Oysters, *Commercial shellfish, *California, Marketing, History, Geographical regions, Pacific coast region, Regions, Southwest U. S., Animals, Aquatic animals, Aquatic life, Benthic fauna, Benthos, Invertebrates, Marine animals, Mollusks, Shellfish.

The history and future of the California oyster industry are discussed, stating that it has entered a relatively active period after being quiescent since 1910. Tables and graphs on trends in production since 1888 are provided.
W69-04442

CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
M. V. Brewington.
Cornell Maritime Press, Cambridge, Maryland, 1953.

Descriptors: *History, *Maryland, *Virginia, *Bays, Commercial fishing, Fishing, Industries, Boating, Recreation, Water sports, Bodies of water, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Southeast U. S.

This history treats Chesapeake Bay as a many-factored area, and traces its growth through specific subjects such as commercial fishing, boating, sports, and others.
W69-04449

RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
Omer L. Carey.
Conference of the Western Economic Association, San Francisco, California, August 22, 1963.

Descriptors: *Recreation demand, *Benefits, *Recreation facilities, *Expenditures, *Evaluation, Recreation, Economic impact, Prices.

The purpose of the paper is to stress the need for economic analyses in the planning of outdoor recreation facilities, and to enumerate some of the techniques which have been used to compute recreation benefits. These techniques include: (1) Willingness to pay. (2) Evaluating economic impact. (3) Value in use - evaluation of consumer surplus in recreation. (4) Cost of alternative facilities as a measure of benefit from public facilities. (5) Opportunity cost of a recreation site, including the 'marginal method', comparing value of recreation and timber per acre of forest.
W69-04453

RECREATION,
Interstate Commission on the Potomac River Basin, Washington, D. C.
Marion Clawson.
In PROBLEMS OF THE POTOMAC ESTUARY, January, 1964, pp 19-22.

Descriptors: *Recreation, *Maryland, *Virginia, *Cost-benefit analysis, Water sports, Cost allocation, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Southeast U. S., Expenditures.

This is a general discussion of the questions which must be answered to estimate the value of recreational benefits resulting from public investments. The material is presented in layman's terms.
W69-04458

FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
D. W. Kelley, and Jerry L. Turner.
A Symposium on Estuarine Fisheries, American Fisheries Society, Special Publication No. 3, 1966, pp 78-82.

Descriptors: *California, *Water resources development, *Estuaries, Sport fishing, Geographical regions, Pacific coast region, Regions, Southwest U. S., Fishing, Recreation, Water sports, Resource development, Bodies of water, Area redevelopment, Conservation, Natural resources, Resources, Reclamation, Coastal engineering, Engineering, Social participation, Water utilization, Coastal plains, Surface waters.

The development of a water plan through the joint efforts of biologists and engineers, '...that appears compatible with other uses of the estuary and that provides opportunities to protect and perhaps enhance the fisheries resources' is presented. The plan relates to the transfer of Northern California waters to Southern California, with respect to water in transit through the delta area. The estuary and its fish and fisheries are described. Estimates are presented of annual sport-fishing expenditures, sport-fish catch, and angler days in the estuary and adjacent areas.
W69-04472

A TEN-YEAR PROGRAM OF FEDERAL WATER RESOURCES RESEARCH.
Federal Council for Science and Technology, Committee on Water Resources Research, Office of Science and Technology, Executive Office of the President, February, 1966.

Descriptors: *Future planning (Projected), *Water resources development, *Federal budgets, Planning, Resource development.

Recommendations for a ten-year program of Federal water resources research are given. One of the recommendations is that Federal research expenditures for research on estuarine problems be increased from an actual level of about $0.5 million annually in 1965 to an annual level of about $1.0 million by 1970.
W69-04473

COMPARISONS OF METHODS FOR RECREATION EVALUATION,
Jack L. Knetsch, and Robert K. Davis.
In WATER RESEARCH, 1966, pp 125-142. Baltimore, Maryland: Johns Hopkins Press, 1967.

Descriptors: *Recreation demand, *Benefits, *Cost analysis, Recreation, Evaluation, Recreation facilities.

Methods of evaluating the benefits from outdoor recreation are reviewed. The only methods supported by the authors are those which are based on the concept of willingness to pay for services provided. Three such techniques are elaborated upon: (1) Interview methods, designed to measure recreationists' willingness to pay higher prices for using a recreation site. (2) Use of an interview method to establish willingness to drive additional distances for recreation. (3) Use of a travel-cost method to establish willingness to incur travel costs as actually measured by a count of automobiles at a recreation site. The three methods gave comparable results when tested on the same recreation area.
W69-04474

THE PRINCIPLES OF WATERFRONT RENEWAL: A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
Richard A. Lehmann.
Landscape Architecture, Vol 56, No 4, July, 1966, pp 286-291.

Descriptors: *City planning, *Aesthetics, *Shores, *Harbors, Landscaping, Planning.

The conclusion reached in this summary is that good waterfront renewal projects should contain these aesthetic goals: (1) physical access, (2) visual access, (3) historic preservation, and (4) site identity.
W69-04476

BENEFIT-COST ANALYSIS: ITS RELEVANCE TO PUBLIC INVESTMENT DECISIONS,
Arthur Maass.
Quarterly Journal of Economics, Vol LXXX, No 2, May, 1966, pp 208-226.

Descriptors: *Cost-benefit analysis, *Public benefits, *Investment, Social values, Feasibility studies, Feasibility, Economic efficiency, Value, Social impact, Social aspects, Benefits.

The author states that 'the major limitation of benefit-cost analysis, as it has been applied in the United States, is that it ranks projects and programs in terms of economic efficiency'. He maintains that economic efficiency is not the only goal of public programs, and that the other goals, such as income redistribution, should be explicitly recognized and integrated into formal project analysis. The author states that trade-offs among the relevant benefit variables must be sought and suggests that establishment of such trade-offs is possible.
W69-04479

MANAGEMENT OF ESTUARINE FISHERIES,
American Fisheries Society, Atlantic City, New Jersey.
J. L. McHugh.
In A SYMPOSIUM ON ESTUARINE FISHERIES, NINTH ANNUAL MEETING, Supplement No. 3, 1966, pp 133-153.

Descriptors: *Estuarine fisheries, *Commercial fishing, *Sport fishing, *Value, Sport fish, Commercial fish, Fish management, Animals, Aquatic animals, Aquatic life, Fish, Wildlife, Water utilization, Efficiencies, Fishing, Industries, Recreation, Water sports, Evaluation, Coasts, Competing uses.

Almost 2/3 (by value) of the U. S. commercial catch and most of the marine sport fish catch is composed of species that spend at least a part of their lives within land-bound estuaries. Dominance of estuarine species is especially great in catches along the Atlantic and Gulf of Mexico coasts. Around 1960, the sport of fish catch was approximately 11 percent of the weight of the total commercial catch. In 1960 a catch of 590 million pounds of sport fish was estimated. For sport fishing, value is measured in money spent by the fishermen in pursuit of this recreation; for the commercial fisherman, value is measured by the dollar return in his catch. There is a need for research into the problems of management and use conflict of estuarine fisheries.
W69-04481

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
R. N. McKean.
New York, John Wiley and Sons, Inc., 1966.

Descriptors: *Cost-benefit analysis, *Systems analysis, *Benefits, *Bibliographies, Direct benefits, Indirect benefits, Government finance.

This book presents a general discussion of the theory and practice of benefit-cost analysis. Of special interest are the discussions regarding the nature of benefits. McKean takes the view that the value of the incremental output, not the incremental value of the industry's output, is what should be considered a benefit. He concludes that secondary benefits should be included in the estimate of benefits only if unemployment would otherwise exist. A five-page bibliography is included.
W69-04482

WHEN DOES A FISHERY BECOME UNECONOMIC,
Robert Morgan.
World Fishing, No. 14, December, 1965, pp 73-74, 77.

Descriptors: *Fish management, *Expenditures, *Demands, Fishing, Management, Commercial fishing, Industries, Productivity, Withdrawal.

The author identifies the basic elements affecting optimum fishing rate as: (1) biological--both the elements affecting organic productivity and the rate of withdrawal by fishing or by mortality from other causes; and (2) economic--elements affecting both the cost of catching and demand. Changes in any of these elements will change the optimum effort of fishing necessary to yield the greatest difference between total economic input and output. The purpose of this article is to point out that, in any consideration of overfishing or in any consideration of what is the best or optimum effort, every consideration should be given to economic factors (costs and prices), as well as to biological factors. The author admits that many simplifications were made, especially in regard to the biological elements, in order to achieve a concise demonstration of the relations between the two elements. The relations are illustrated with a diagram in which effort in standard vessel units is plotted against value and cost per week. The basic curve is that of total weight caught in relation to total effort expended, each taken as an average over a period of time.
W69-04485

THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
R. J. Nitsos, and P. H. Reed.
California Fish and Game, Vol 51, No 1, 1965, pp 16-25.

Descriptors: *Fisheries, *Furbearers, *Trawling, *Fish, *California, Production, Fishing, Animals, Aquatic animals, Aquatic life, Wildlife, Geographical regions, Pacific coast region, Regions, Southwest U. S., Statistics, Data collections.

Trawling produced 3.8 million pounds of fish in 1961 and 1.8 million pounds in 1962. These fish, some 60 species, are utilized primarily by the fur-farm industry.
W69-04487

COST-BENEFIT ANALYSIS: A SURVEY,
A. R. Prest, and R. Turvey.
The Economic Journal, Vol LXXV, No 300, December, 1965, pp 683-735.

Descriptors: *Cost-benefit analysis, *History, *Bibliographies, *Surveys, Water resources, Resources.

A comprehensive review of cost-benefit analysis is presented. The history of cost-benefit analysis, general principles of application, pertinent issues involved, and applications to water and other subjects are examined. An excellent bibliography is included.
W69-04492

PUBLIC WORK NEEDS -- MARINE PORT FACILITIES.
Maritime Administration, Department of Commerce, June, 1966.

Descriptors: *Harbors, *Construction costs, *Planning, *Estimated costs, Data collections, Federal government, Coasts, Construction, Cost allocation, Cost analysis, Cost trends, Long-term planning, Administration.

Prepared for the Joint Economic Committee of the Congress, this report describes the existing ports and terminal facilities of the United States, the trend of capital outlays for port development, and the needs and prospective capital outlays for port development 1966-1975. The Maritime Administration projected that the capital requirements for port terminal facilities during the decade 1966-1975 are estimated to be $1,281.5 million. $605.7 million are allocated to ports on the three sea coasts. It is believed Federal financial assistance will not generally be required.
W69-04495

BENEATH THE SURFACE,
Edwin L. Rothfuss.
Report, Parks and Recreation, September, 1966, pp 715-716, 810.

Descriptors: *National parks, *Virgin islands, *Recreation, *Water sports, *Statistics, Scuba diving, Natural resources, Scenery, Federal reservations, Parks, Geographical regions, Islands, Regions, Swimming, Data collections, Underwater, Resources.

Two areas in the U. S. Virgin Islands, Virgin Islands National Park and Buck Island Reef National Monument, administered by the National Park Service, have become known as 'underwater parks'. They exhibit outstanding gardens, marine life, and seascapes and have become very popular snorkeling and skin diving areas. Scheduled underwater trips are led by a park naturalist. In 1965, a total of 793 persons were led on 73 organized trips. By September, 1966, there was already a 72 percent attendance increase over 1965. At Buck Island approximately 85 percent of the 15,461 visits to the monument last year were underwater trail uses. In Virgin Islands National Park, 1965 visitation of 57,000 showed a 17.6 percent increase by September, 1966. Scuba diving, snorkeling, and underwater photography are becoming important water recreation activities.
W69-04497

NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
Ralph A. Schmidt.
A Symposium on Estuarine Fisheries, American Fisheries Society, Special Publication No. 3, 1966, pp 102-109.

Descriptors: *Estuarine fisheries, *Tidal marshes, *Dredging, *Permits, *Water management, Programs, Planning, Legal aspects, Land reclamation, Commercial fishing, Sport fishing, Northeast U. S., Fishing, Industries, Recreation, Water sports, Fisheries, Marshes, Wetlands, Legal aspects, Legislation, Northeast U. S., Atlantic coastal plain, Geographical regions, Regions, Management.

The author presents estimates of average annual weight and value of commercial finfish and shellfish landings during the 1952-61 period for the North Atlantic Coast (Delaware to Maine), and the share of total U. S. landings these accounted for. Results of the Fish and Wildlife Service recommendations in the case of permit requests for dredging, land reclamation, etc., in the New York City-Long Island area and the New England area are discussed. The author points out that many permits have been granted contrary to recommendations made by the Fish and Wildlife Service. Estimates of physical loss of tidal marsh area from Maine to Delaware during the 1954-59 period (23,500 acres) and during the 1959-65 period (21,500 acres) are given. A breakdown by end-use of marsh area lost is also given. Legislation relating to tidelands preservation in North Atlantic Coastal States is discussed.
W69-04499

ON THE USES AND ABUSES OF ECONOMIC SCIENCE IN EVALUATING PUBLIC OUTDOOR RECREATION,
David N. Seckler.
Land Economics, Vol XLII, No 4, November, 1966, pp 485-494.

Descriptors: *Recreation demand, *Cost-benefit ratio, Recreation, Benefits, Demand, Social aspects.

Three theoretical techniques are commonly used in connection with statistical demand curves for recreation. They are: (1) Computation of benefits attributable to a recreation project as the area under the demand curve, and comparing with total project costs. (2) Defining optimum price and usage as the point where Marginal Cost = Marginal Utility, producing a maximum B-C ratio. (3) Using demand curve to compute maximum revenue available from a recreation facility. The author criticizes demand curves in general, arguing that they do not measure the utility function of recreation facilities, but reflect the diminishing marginal utility of income. He criticizes procedures to allocate recreation usage by market processes and points to the bias inherent in these methods towards higher users of recreation. The author proposes that demand curves be corrected for effects of unequal income distrubution and that corrected demand curves be applied to Technique 2 for evaluation of recreation facilities. He further porposes that real prices implicit in this evaluation not be used in actuality unless recreation is to be limited to the wealthy.
W69-04500

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W69-04504

A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
Battelle Memorial Inst., Columbus, Ohio.

Report, January 17, 1966.

Descriptors: *Surveys, *Continental shelf, *Economic impact, *Federal government, Regions, Continental margin, Mining, Mineral industry, Exploration, Drilling, Offshore platforms, Oil industry, Civil engineering, Coastal engineering, Recreation, Ships, Tsunamis, Saline water intrusion, Water quality, Transportation, Commercial fishing, Resource development, Governments, Generators, Agriculture, Military aspects, Research and development, Communication, Electric generators, Water resources development, Industries, Engineering structures, Hydraulic structures, Structures, Engineering, Public health, Fishing, Foods, Electrical equipment, Equipment.

The services provided by the United States Coast and Geodetic Survey are evaluated in terms of influence and effect on economic activities in the United States Continental Shelf regions. Activities are broken down into ten major groups for the purpose of this study: (1) Mining and petroleum, (2) Marine engineering, (3) Recreation, (4) Health and welfare, (5) Transportation, (6) Food and agriculture, (7) Defense and space (U. S. Coast Guard included), (8) Research and development, (9) Industry (not elsewhere classified), (10) State and local agencies. Each category covers the economic activity within the group in the U. S. continental-shelf regions, the dependency of that activity upon U. S. Coast and Geodetic Survey products and services, and the uses of and present needs for additional U. S. Coast and Geodetic Survey products and services relating to the U. S. continental-shelf regions. Sub-categories within each category are discussed in four aspects: (1) Estimate of present economic activity, (2) Estimate of worth of USCGS products and services, (3) Description of user problems and needs, (4) Estimate of future economic activity.
W69-04505

TOURISM AND RECREATION.
Little (Arthur D.), Inc., Cambridge, Mass.

Report, October 10, 1966. Project No. C-68388.

Descriptors: *Recreation, *Tourism, *Bibliographies, Water sports, Fishing, Boating, Sport fishing, Hunting.

This report appears to be based on a literature search on recreation and tourism. It encompasses leisure time activities in the United States, as a whole. Chapters on boating, hunting, and sport fishing in the United States are included. The report contains a large bibliography.
W69-04510

THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
Jacksonville Univ., Fla. Div. of Business Administration.
N. E. Weis, and S. W. McFarland.
Report, 1965.

Descriptors: *Harbors, *Economic impact, *Florida, Income, Employment, Wages, Atlantic coastal plain, Coastal plains, Geographical regions, Gulf coastal plain, Regions, Southeast U. S., Income analysis, Analysis, Mathematical studies, Economic life, Benefits.

The volume of income resulting from and generated by the flow of goods imported and exported at the Jacksonville Talleyrand Docks and Terminal facilities during 1964 is analyzed. Principal attention is placed on an analysis of the factors and conditions which contributed to the flow of income both as a direct result of the activities of this port facility and as an indirect result of income flow from supporting services and industries. Community benefits in wages, taxes, and services are evaluated.
W69-04517

LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
For primary bibliographic entry see Field 04A.
W69-04518

THE POLITICAL ECONOMY OF EFFICIENCY: COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
Aaron Wildavsky.
Public Administration Review, Vol 26, No 5, December, 1966, pp 292-310.

Descriptors: *Cost-benefit analysis, *Systems analysis, *Financial feasibility, *Political aspects, Programs, Decision making, Economic efficiency, Budgeting, Administration, Financial analysis, Cost comparisons, Governments, Local governments, Political constraints, Constraints.

Some of the useful features and shortcomings of cost-benefit analysis, systems analysis, and program budgeting techniques for achieving economic efficiency are pointed out. Also discussed are the political realities involved in the application of these techniques, as well as the interrelationship between programs for economic efficiency and the political process.
W69-04519

METROPOLITAN PLANNING AND RIVER BASIN PLANNING: SOME INTERRELATIONSHIPS,
Georgia Inst. of Tech., Atlanta. School of Architecture.
For primary bibliographic entry see Field 06A.
W69-04566

MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-04578

DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
Illinois State Water Survey, Urbana.
T. A. Prickett.
Ground Water, Vol 5, No 4, 1967. pp 38-46, Oct 1967. 9 p, 9 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Pumping, *Analog models, *Model studies, Design criteria, Water wells, Hydrologic data, Reservoir yield, Aquifers, Simulation analysis.
Identifiers: Pumped well characteristics, Electric analog models.

Errors that exist at the pumped well junctions of nonsteady-state two-dimensional flow electric analog models were analytically analyzed. The results of the study indicate that practical sustained yields and water-level data derived from pumped well junctions of electric analog models lead to overly optimistic estimates of aquifer and well yielding capabilities. This paper presents design methods for simulating pumped wells having different radii, screen lengths, partial penetrations, gravel pack sizes, and well-loss constants. The article contains the following chapters: (1) introduction; (2) pumped well junction analysis; (3) simulating pumped wells with different radii; (4) simulating pumped wells of different penetration; (5) simulating pumped wells with different turbulence losses; (6) various pumped well characteristics; (7) capacitor network analysis; and (8) summary. (Gabriel-USGS)
W69-04623

BENEFIT-COST ANALYSIS FOR WATER RESOURCES PROJECTS: A SELECTED ANNOTATED BIBLIOGRAPHY.
Tennessee Valley Authority, Knoxville.

TVA Report, Oct 1967. 105 p, 212 ref.

Descriptors: *Cost-benefit analysis, *Bibliographies, Water resources development, *Project benefits, Forecasting, Evaluation, Economic prediction, Water demand, Recreation demands, Decision making, Flood control, Water pollution control, Navigation, Land appraisal.

The 212 citations in this bibliography are concerned with the current state of the art of benefit-cost analysis for water resource projects. Principal emphasis is placed on the following project purposes: (1) Flood Control, (2) Navigation, (3) Pollution (Quality Control, and (4) Recreation. Enhancement of land value surrounding a water resource project is also emphasized. Although a water resource project may serve other purposes such as hydroelectric power and irrigation, these purposes are not explicitly considered in this compilation. For the ease of those concerned with specific aspects of project evaluation, under each subject area the literature reviewed is classified into the following basic steps in performing a benefit-cost analysis: (A) Definition of Costs and Benefits, (B) Forecasting Demand, (C) Benefit Measurement or Cost Determination, (D) Evaluation Techniques, and (E) Decision Criteria.
W69-04629

FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
Morris M. Cohn.
Water and Wastes Engineering, Vol 5, No 9, pp 66-67, Sep 1968. 2 p.

Descriptors: *Water resources development, *Water resources planning, *Long-term planning, *New york, Governments, Government financing, State government, Local governments, Water management, Administrative agencies, Administrative costs, Research and development, Government regulation, Water quality, Water pollution control.

New York State has been urged to manage its water resources by practicing long-range planning, coupled with dynamic development to produce water quality and water quantity-in other words P plus D equals 2Q. This article briefly reviews nine years of water planning in New York by the Temporary State Commission on Water Resources Planning and its subsequent transferee the Joint Legislative Committee on Water Resources Conservation. Under the Water Resources Planning Law of 1959, the State has encouraged local multi-purpose planning by paying 75% of the costs of such local planning work. The recent natural drought in the Northeast that affected New York, along with a different kind of drought caused by pollution and the statement of the Temporary State Commission that the time for development action was due or overdue has spurred the creation of a development agency, the State Pure Waters Authority. This agency was created initially to spur the State's governor-sponsored, multi-billion dollar pollution control program. The main thrust of the planning agencies is toward present implementation of the formula for Water Resources Management: P plus D equals 2Q. (Carruthers-Fla)
W69-04646

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PROBLEMS OF A DRILLING CONTRACTOR,
Alden J. Laborde.
Ocean Industry, Vol 2, No 4, April, 1967, pp 22-25.

Descriptors: *Offshore platforms, *Oil wells, *Operating costs, *Drilling, Oil industry, Oil fields, Industries, Engineering structures, Hydraulic structures, Structures.

The author discusses various problems and costs associated with oil rig operations. He gives a breakdown of certain operating costs: insurance, interest, and other costs.
W69-04275

PORTS OF THE WORLD, 1967.
Shipping World, Benn Brothers, Ltd., Bouverie House, Fleet Street, London England.

Descriptors: *Harbors, *Data collections, *Facilities, Equipment, Ships.

The locations and available facilities of the major ports of the world are given. The information includes data on port charges, pier space, anchorages, inland transportation, bunkers, repair facilities, and some traffic data. Pages 471 through 532 include data on United States ports.
W69-04320

STATEMENT.
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
For primary bibliographic entry see Field 05G.
W69-04342

WATER USE AND RELATED COSTS WITH COOLING TOWERS,
B. Berg, R. W. Lane, and T. C. Larson.
American Water Works Association, Journal, Vol 56, No 3, March, 1964, pp 311-329.

Descriptors: *Costs, *Cooling towers, *Evaluation, *Water reuse, Thermal pollution, Temperature, Economic feasibility, Engineering structures, Feasibility, Assessments, Cost comparisons, Analysis, Cost analysis, Mathematical studies, Water utilization, Efficiencies.

This study is primarily an economic evaluation of cooling towers for water reuse compared with once-through use. The authors state that this report presents a method whereby approximate costs for specific cooling-tower applications may be estimated and compared with the costs of non-conservative practices. The study identifies eight kinds of information needed to assess the costs of cooling-tower operations in any specific situation.
W69-04443

THE CONTRIBUTION OF THE AMERICAN MERCHANT MARINE TO THE U. S. BALANCE OF PAYMENTS.
Report, Committee of American Steamship Lines, Washington, D. C., June, 1963.

Descriptors: *Ships, *Economic impact, *Transportation, *Benefits, Foreign trade, Monetary benefits.

During recent years, operations of the U. S. Merchant fleet have contributed or saved foreign exchange expenditures totaling between 3/4 and one billion dollars per year. The U. S. liner vessels presently carry less than 30 percent of the total cargo liner movement in our foreign trade. It is estimated that if their participation were increased to the 50 percent level, the U. S. Merchant Marine's favorable contribution to our balance of payments would be increased more than $250 million per year.
W69-04460

WATER DESALINATION: PROPOSALS FOR A COSTING PROCEDURE AND RELATED TECHNICAL AND ECONOMIC CONSIDERATIONS.
For primary bibliographic entry see Field 03A.
W69-04513

6D. Water Demand

WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
Georgia Univ., Athens. Dept. of Geography.
John R. McGregor.
University of Georgia, Athens, Georgia, January 1969. 67 p, 2 fig, 1 map, 20 tab, 4 append. OWRR Project A-014-GA.

Descriptors: *Industrial water utilization, *Water users, *Water requirements, *Georgia, Water quality, Industrial water treatment, Waste water treatment.

Forty-four manufacturing industries of four-digit Standard Industrial Classification typical of North Georgia were studied to define their water requirements and to classify them in terms of their water requirements. Data for the research were collected by direct interviews and mail questionnaires. The per employee annual water intake requirement for most industries was approximated. This requirement in some industries was found to vary sharply with size or with specific products. Based on the annual per employee intake water requirement, the industries were classified into three distinct groupings--those requiring less than 10,000 gallons, those requiring 10,000 to 99,000 gallons, and those requiring 100,000 gallons or more. Significant differences in overall water requirements were found to occur among industries of the three groupings. The variety of uses of water was found to increase as the intake water requirement expanded.
W69-04205

'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
P. H. Cootner, and G. O. Lof.
In RESOURCES FOR THE FUTURE, Johns Hopkins Press, Baltimore, Maryland, 1965.

Descriptors: *Electric power, *Water demand, *Cooling tower, *Thermal pollution, Economic efficiency, Steam, Demand, Water utilization, Efficiencies, Heated water, Engineering structures, Equipment, Electric power production, Water pollution.

This publication discusses technical and economic aspects of water demand for steam electric generation. Technical information on water demand and thermal pollution is presented. Economic information is presented on water use including the economic factors involved in cooling tower technology. A regional model to calculate expected cooling water demand is developed. The report does not deal specifically with saline water use for cooling.
W69-04461

THE PUBLIC INTEREST IN PRESERVING NATURAL AREAS,
J. V. Krutilla.
In THE MAINE COAST--PROSPECTS AND PERSPECTIVES, October, 1966, pp 8-12. Bowdoin College, Brunswick, Maine, Center for Resource Studies.

Descriptors: *Natural resources, *Maine, *Conservation, Recreation, Geographical regions, New England, Northeast U. S., Regions, Resources.

There is a decreasing availability of natural resource commodities except at increasing real cost. The problem is generating interest in maintaining reserves of natural resources, whether fossil fuel or camping grounds. The public should support the maintenance of reserves, because if they do not enjoy these resources at present they will be holding the option to do so in the future. This 'option demand' is an investment.
W69-04475

BENEFIT-COST ANALYSIS FOR WATER RESOURCES PROJECTS: A SELECTED ANNOTATED BIBLIOGRAPHY.
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 06B.
W69-04629

TOWN OF GREENWICH V GREENWICH WATER CO (PUBLIC UTILITY RIVER DIVERSION).

145 Conn 526, 144 A 2d 318 (1958).

Descriptors: *Connecticut, *Public utilities, *Water distribution (Applied), *Dam construction, Judicial decisions, Governments, Permits, Water permits, Legal aspects, Flooding, Riparian rights, Interstate rivers, Eminent domain, Diversion, Water supply, Reservoirs, Interstate.
Identifiers: Public utility commissions.

Defendant, a Connecticut public service water company, entered into a contract with a New York water company to construct a dam on an interstate river for the purpose of enlarging its reservoir capacity to meet increasing demands for water. The project, which would divert the river from the adjacent lands of plaintiffs, was approved by both the New York Public Service Commission and the Connecticut Public Service Commission. The court held that the commission has authority to hold hearings on the contract to determine whether its formation was in the public interest. The contract was not an attempt to allocate and divide the waters of an interstate stream contrary to a state statute which confers such power only upon the attorney general. On appeal, the supreme court held that the trial court should not retry the case; rather it should merely determine if the commission has abused its discretion or acted arbitrarily. (Molica-Fla)
W69-04688

JONES V OZ-ARK-VAL POULTRY CO (RIGHT TO THE USE OF SUBTERRANEAN WATERS).

306 SW 2d 111-117 (Ark 1957).

Descriptors: *Reasonable use, *Arkansas, *Percolating water, *Pipe flow, Judicial decisions, Water rights, Wells, Subsurface waters, Industrial water, Water consumption, Water allocation, Legal aspects.
Identifiers: Injunctions (Prohibitory).

Plaintiffs owned small parcels of land on which they resided. The defendant owned land adjacent to plaintiffs. Defendant drilled water wells on his property, and the water from these wells was piped to chicken processing plants operated by another defendant. Plaintiffs wells, used for domestic purposes, ran dry allegedly because of the large amounts of water used by the processing plant. The court discussed the English common law rule and the American reasonable use rule as to water rights of riparian owners. The court concluded that plaintiffs were entitled to an injunction since Arkansas has adopted the reasonable use rule which applies to subterranean percolating waters. The perponderance of the evidence showed that the drying up of plaintiffs wells was a direct result of defendants unreasonable use of the water. (Heckerling-Fla)
W69-04690

6E. Water Law and Institutions

THE ROLE OF LAW IN A SYSTEM FOR LAKES ERIE AND ONTARIO,
Ohio State Univ., Columbus. Water Resources Center.
Earl Finbar Murphy.
Ohio State University Water Resources Center, Third Annual Symposium on Water Resources Research, Systems Approach to Water Quality in the Great Lakes, September, 1967, pp 105-115.

Descriptors: Methodology, Lake Erie, Lake Ontario, Dynamic programming, Non-structural alternatives, Water pollution control, Administrative agencies, Legal aspects, Jurisdiction.

The essay examines the role of law in a system to improve water quality of Lakes Erie and Ontario, the most polluted of the Great Lakes. Existing legal bodies pass laws that cannot be enforced. The essay suggests that the proposed Great Lakes Basin Commission be given jurisdiction in all the areas where drainage breaks toward the lakes. It should work closely with national, state, local, and other governments in the area, but should be allowed to form and govern itself. Models for such an approach are the Ruhrverband in Germany, the Delaware River Basin Commission in the United States, and the stream control associations in England. Means of financing are discussed. Systems analysis as a method is discussed as a dynamic mode of analysis that views nature as a whole, man as a single part. Its function is to create viable balances of nature based on patterns of human activity; and, if this is impossible, to provide the evidence for legislating change in human activity. (Gossen-Chicago)
W69-04212

A CITY AND REGIONAL PLANNING APPROACH TO A SYSTEMS APPROACH TO WATER QUALITY IN LAKE ERIE AND LAKE ONTARIO,
Ohio State Univ., Columbus. Water Resources Center.
Israel Stollman.
Ohio State University Water Resources Center. Third Annual Symposium on Water Resources Research, Systems Approach to Water Quality in the Great Lakes, September, 1967, pp 127-129.

Descriptors: Methodology, Dynamic programming, Coordination, Environment, Decision-making, Planning, Systems analysis.

There are four principles of systems analysis: (1) concern with long-run consequences of action, (2) coordinating decisions of several jurisdictions who share the effect of decisions, (3) the interconnectedness of all phenomena, and (4) dynamic planning to continually guide decisions. Planners have three activities: relating their problem to other environmental variables, resolving competing natural and human demands, and providing a framework for choices at every decision-making level, individual, local, state, federal, and international. Relevance and irrelevance of certain variables are discussed. In the thirties, the National Resources Planning Board, effectively began a comprehensive study of the interrelatedness of human and natural activities but the Board was dropped in the early forties. The crisis of the Great Lakes and their industrial neighbors compels the reinstitution of such a study. The Great Lakes Basin Commission coordinates governments for water management. It is hoped that similar steps be taken for environmental management. (Gossen-Chicago)
W69-04214

MARINE SCIENCE AFFAIRS...A YEAR OF TRANSITION.
Report of the President to the Congress on Marine Resources and Engineering Development, February, 1967.

Descriptors: *Legislation, *Federal Government, Legal aspects, Water resources, Resources, Bays, Bodies of water, Coasts, Governments.

This document is the initial report by the Marine Sciences Council to the President and puts forth steps taken to meet the objectives of the Marine Resources and Engineering Development Act of 1966. A brief section, 'Man's Uses of the Shoreline', discusses estuary problems and refers to the planned scale model of the Chesapeake Bay to be built by the Corps of Engineers.
W69-04286

A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
Thompson (John I.) and Co., Washington, D. C.
Gilbert L. Maton, E. R. Christie, and M. J. Tenzer.

Institute of Public Administration, Report PB-177 765, February 29, 1968.

Descriptors: *Fish conservation, *Water pollution, *Federal-state water rights conflicts, *Federal jurisdiction, *State jurisdiction, Structures, Hydraulic structures, Engineering structures, Water treatment, Water purification, Separation techniques, Harbors, Marinas, Breakwaters, Shore protection, Marine animals, Marine fish, Marine fisheries, Commercial fishing, Sport fishing, Commercial shellfish, Saline water fish, Wildlife, Conservation, Wildlife conservation, Aquatic plants, Plants, Demineralization, Shellfish, Invertebrates, Industries, Fishing, Marine plants, Recreation, Desalination, Industrial wastes, Wastes, Recreation facilities, Fisheries, Animals, Aquatic animals, Aquatic life, Fish, Water sports.

This report contains a summary of data derived from questionnaires sent by the authors to qualified representatives of each of the states and territories of the United States bordering on the coasts or Great Lakes. The purpose of the report was to present information concerning the organization and function of state, local, and regional governmental agencies involved in marine environmental activities. These activities were classified into six functional areas: (1) recreation, (2) commercial fishing and living resources, (3) waste disposal, (4) non-living resources, (5) maritime commerce, and

(6) conservation. Observations: The state executive structure for marine environment activities is a diffuse policy and planning network loosely connected but with enough interaction among the cognizant agencies to permit the essential and critical programs to happen. State governments understand the significance of the marine environment and are making good policy decisions, but they take too long to do so. The states fear federal intervention in areas which have traditionally been in state control, such as sports, commercial fishing, pollution, and conservation. A bibliography associated with this study is cited elsewhere in this compilation (Report No. PB-177 764).
W69-04289

A MODEL LAND DEVELOPMENT CODE.
Tentative Draft No. 1, American Law Institute, April 24, 1968.

Descriptors: *Land development, *Governments, *Legislation, *Planning.

This is a draft of proposals concerning the legal status of the planning process. The general conclusion is that there are some techniques of regulation that a governing body should not be able to use unless there is written evidence of forethought (i.e., written plans). The proposed code is divided into 12 articles. The following is a summary of the code: (1) It grants power to local government to control land development. (2) It specifies the content of a land development plan. (3) It specifies the ways a locality can regulate development by zoning, architectural review, and eminent domain. (4) Compensation to land owners for loss of value because of coming under a new plan (e.g., zone changes from industrial to urban). (5) It suggests the standardization of procedures within the state for all permits for land development.
W69-04301

VANISHING TIDELANDS,
Polly Redford.
Atlantic Monthly, Vol 219, June, 1967, pp 75-83.

Descriptors: *Legislation, *Water pollution, *Wildlife conservation, *Habitat improvement, Water conservation, Conservation, Habitats, Environment, Management, Wildlife management, Tidal marshes, Marshes, Wetlands, Adoption of practices.

This is a journalistic portrayal of the U. S. estuaries through the eyes of a conservationist. It was written in support of Dingell's bill HR 25 and discusses some of its points. The article outlines the contamination of the Merrimack River north of Boston. Efforts by conservationists to buy sections of natural estuarine habitat are discussed.
W69-04323

STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
Report, John I. Thompson and Company, Washington, D. C., PB-177 764, February 14, 1968.

Descriptors: *Great Lakes region, *Coasts, *Governments, *Statistics, *Surveys, Geographical regions, Regions, Data collections.

The bibliography covers state and local administration of facilities and programs for marine activities in states on the seacoasts and bordering the Great Lakes.
W69-04341

SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
For primary bibliographic entry see Field 05B.
W69-04366

WATERWORKS AND WATER SUPPLIES.
For primary bibliographic entry see Field 04A.
W69-04367

PAXSON V COLLINS (TITLE TO ACCRETION AND RELICTION).
100 So 2d 672-676 (3rd DCA Fla 1958).

Descriptors: *Florida, *Accretion (Legal aspects), *Riparian rights, Judicial decisions, Reliction, Boundaries (Property), Navigable waters, Ownership of beds, Seashores, Riparian land, Shores, Littoral drift.
Identifiers: Internal Improvement Fund.

The plaintiff landowners brought this suit to quiet title to lands added to the boundaries of their riparian lots by accretion. The complaint asked further that the defendant Trustees of the Internal Improvement Fund and Central and Southern Flood Control District be enjoined from conveying these accreted lands or otherwise encumbering them. On appeal from the circuit court, this court rejected the Trustees' contention that the accretions were 'submerged sovereignty lands' and hence the plaintiff's could claim no title in them. Florida follows the common-law rule vesting title to soil formed along navigable waters by accretion or reliction in the owners of the abutting land. The allegation that the defendant trustees had conveyed title to relicted lands claimed by the plaintiffs was sufficient for the circuit court of the county in which the lands were situated to obtain venue in a suit to quiet title. (Blunt-Fla)
W69-04368

FARELLY LAKE LEVEE DISTRICT OF JEFFERSON AND ARKANSAS COUNTIES V HAMPTON (RATIFICATION OF CONTRACT TO REPAY CONTRIBUTIONS FROM LANDOWNERS).

306 SW 2d 699-700 (Ark 1957).

Descriptors: *Contracts, *Arkansas, *Judicial decisions, *Levees, Rivers, Financing, Legal aspects, Contracts, Right of way.
Identifiers: Arkansas River, Ratification, Adoption, Injunctions, Ultra vires.

The State of Arkansas established plaintiff levee district by a Special Act in 1913. By 1928, the district was placed in receivership. In 1938, while plaintiff was still in receivership, the banks of the Arkansas River began caving in, and it became necessary to set the levee back to protect property. Plaintiff had no money with which to purchase a new right of way. The land for the right of way was donated by the owners of property where the new levee was to be located. One Mahaffy refused to donate a right of way, and the donating landowners contributed funds to purchase his land. Plaintiff passed a resolution stating its intent to reimburse the contributions made. This suit was brought to enjoin repayment of this alleged debt. The court held that the contributions were made voluntarily, and, since plaintiff had no authority to borrow the money, it could not later declare the loan a debt of the levee district. A contract invalid in the beginning for want of capacity or power to contract cannot later be notified. (Heckerling-Fla)
W69-04369

HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).

154 F Supp 46-51 (WD Ky 1957).

Descriptors: *Tennessee Valley Authority Project, *Dams, *Gates, *United States, Judicial decisions, Legislation, Boating, Fishing, Reservoirs, Rivers, Coast guard regulations, Boating regulations, Buoys.
Identifiers: *Federal Tort Claims Act, *Negligence.

Plaintiff brought suit under the Federal Tort Claims Act, against the United States and the TVA, as administrator of the estates of two decedents drowned in waters controlled by the TVA. Plaintiff alleged negligence on the part of U S Engineers in charge of the Kentucky Dam Lock, and the Coast Guard in placing buoys to show a danger zone above the dam. A gate in the dam had been opened, causing the boat in which decedents were riding to be capsized. The court held for the defendants. The Federal Tort Claims does not cover claims against the United States arising from actions of the TVA. With regard to the claim against the TVA itself, the court held that there was no duty to warn of an obvious condition of danger. The court further held that the decedents were guilty of contributory negligence and had assumed the risk in choosing to fish in an area of known danger. (Williams-Fla)
W69-04370

FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).
For primary bibliographic entry see Field 04C.
W69-04371

RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).
For primary bibliographic entry see Field 05B.
W69-04372

HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
For primary bibliographic entry see Field 04A.
W69-04373

INTERNAL IMPROVEMENT FUND OF STATE OF FLORIDA V NOWAK (USE OF MEANDER LINES IN SETTING BOUNDARIES OF RIPARIAN PROPERTY).

401 F 2d 708-718 (5th Cir 1968).

Descriptors: *Boundary disputes, *Meanders, *Florida, *Rivers, High water mark, Property boundaries, Riparian rights, Federal jurisdiction, Legal aspects, Judicial decisions, Maps, Mapping, Condemnation, Riparian land.
Identifiers: Federal law, Plats.

The United States instituted condemnation proceedings against a tract of marshland claimed by appellant, a representative of the state, and appellee. The latter claimed to have purchased the tract as part of a larger parcel of land, although the tract in question had been omitted from the original plat map. Appellant claimed that since the tract did not appear on the map, it had never been conveyed. Evidence showed that the original surveyor had intended to meander a river which formed the common boundary of both the disputed tract and appellee's mapped land, but had instead incorrectly drawn the meander line so that it severed the marshy tract from appellant's adjacent land. The court, in finding for the appellee, stated that meander lines are not generally considered to be actual boundaries. The boundary of riparian land is considered to be the waterline itself, where there is evidence that this was the surveyor's intent. (Kelly-Fla)
W69-04374

HAMBURG REALTY COMPANY V WOODS (OWNERSHIP OF LAND FORMED IN RIVER).

327 S W 2d 138-155 (Mo 1959).

Descriptors: *Judicial decisions, *Missouri, *Accretion (Legal aspects), Islands, Missouri River, Alluvion, Reliction, Boundaries (Property), Rivers, Intermmittent streams, Developed waters, Watercourses (Legal), High water mark, Navigable waters, Navigable rivers, Riparian rights, Sand bars, Currents (Water).
Identifiers: Deeds, Adverse possession.

In an action to quiet title to certain land situated in the Missouri River, plaintiff alleged fee simple record title from the county. Defendant asserted title by adverse possession. The land in question was formed by a change in the course of the river and abutted an island owned in part by plaintiff and by defendant. The plaintiff paid the county $766.32 for the land (613.05 acres). The defendant alleges that plaintiff acquired no valid record title to land because: (1) its deed from the county was not shown to have been executed by authority of the county court; and (2) the deed did not describe any ascertainable areas or tract of land. The court, after viewing numerous deeds and 60 or more maps of the area, and after reviewing the oral testimony of several witnesses, held that the deed was not void for indefiniteness and that the evidence sustained a finding that such lands were formed independently of an island conveyed by the county to the plaintiffs, and that defendants were not entitled to such land under their deed to the island which included the island as it stood at the time of their deed together with all lawfully accreted land. The land in question was not accreted to the island and therefore does not inure to the riparian owner. (Heckerling-Fla)
W69-04375

POIRE V SERRA (INJUNCTION PROHIBITING THE FILLING IN OF A RIVER).

106 A 2d 391-393 (N H 1954).

Descriptors: *New Hampshire, *Riparian rights, *Reasonable use, *Alteration of flow, River flow, Judicial decisions, Rivers, Flow rates, Landfills, Sedimentation, Damages, Eddies, Obstruction to flow, Beneficial use, Streams, Docks, Legal aspects, Riparian land.
Identifiers: Injunctions, Irreparable damages.

Plaintiffs, riparian owners, operated a boat and bait business on the banks of a river. Defendant's land was upstream, adjacent to that of plaintiffs. Defendant, a stone mason, began to fill in a portion of the river directly adjacent to plaintiffs' main boat dock for the purpose of storing materials and equipment for his trade. Plaintiffs brought a bill in equity to permanently enjoin further filling and further, praying for a mandatory injunction commanding removal of part of a wall and all of the fill already in place. The trial court granted the prohibitory injunction but refused to grant the mandatory injunction requiring removal of the existing fill because that present use was held to be reasonable. The court said the existing fill did not constitute an obstruction which would change the flow in any appreciable degree nor cause any appreciable sedimentation build up at plaintiffs' dock. On appeal by plaintiffs, it was held that the trial court's findings were supported by the evidence. (Wheeler-Fla)
W69-04376

WATER IMPROVEMENT COMMISSION.
For primary bibliographic entry see Field 05G.
W69-04377

YOUNG V CITY OF ASHEVILLE (RIPARIAN RIGHTS).

241 N C 618 86 S E 2d 408-416 (1955).

Descriptors: *Riparian rights, *Irrigation, *Water pollution, *North Carolina, Stream flow, Prescriptive rights, Sewage, Water law, Contaminants, Nuisance, Impaired water quality, Non-consumptive use, Fouling, Water quality, Water rights, Alteration of flow, Judicial decisions.

Plaintiff lessee's vegetable crops became contaminated when he used polluted creek water to irrigate them. A polluted creek is not a nuisance per se to a non-riparian owner nor is it a nuisance to a non-riparian owner unless his rights are invaded by the pollution. Plaintiff neither alleged that he was a riparian proprietor nor that he had acquired rights to use the creek for irrigation by prescription or adverse use. Lessee did not show he had license from the riparian owner to have the creek waters flow with undiminished quality. Lessee's damage was caused by his own act of sprinkling his cabbages and collards with creek water polluted by raw sewage, and not by an invasion of his rights by the polluter. (Hoffman-Fla)
W69-04378

WHARVES AND FISH WEIRS.
For primary bibliographic entry see Field 04A.
W69-04379

MUNICIPALITIES.
For primary bibliographic entry see Field 04D.
W69-04380

SOIL AND WATER CONSERVATION DISTRICTS.
Me Rev Stat Ann tit 12, secs 2, 3, 5, 6, 52, 53, 54, 101, 151, 154, 155, 156, 157, 158 (1965), secs 1, 3, 4, 6, 7, 51, 54, 102, 151, 152, 153, 156, 201 (Supp 1968).

Descriptors: *Soil conservation, *Statutes, *Maine, *Water conservation, Erosion control, Land management, Planning, Riparian rights, Water resources, Federal government, Legal aspects, State government, Administrative agencies, Erosion, Flood protection, Water utilization, Water management (Applied).
Identifiers: *Soil and water conservation districts, Land occupiers, Commissions.

These sections provide for Soil and Water Conservation Districts. The Committee and districts shall be created to effectuate the conservation policy of the Legislature. The district's powers and duties may not infringe upon or impair rights of any owner of riparian lands. The districts, as agents of the state, shall have power to implement preventive flood control measures: to obtain property, which thereafter will be tax exempt; to make equipment available to assist landowners in soil and water conservation; to contract and negotiate with any agency of the United States Government; and to have all the legal rights of a corporate entity. The Attorney General may be called upon for such legal advice as the Committee may require. The Committee members shall be elected for classified four-year terms and only reasonable expenses are allowed as compensation. The Committee shall offer assistance, information, and coordination to supervisors of the various districts. The supervisors of the districts shall be nominated and elected by land occupiers in the district. Where the need is such, any twenty-five land occupiers may petition the Committee for the establishment of a district, and the Committee will hold hearings to determine if a referendum should be submitted to the land occupiers of the proposed district. (Dean-Fla)
W69-04381

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
For primary bibliographic entry see Field 05G.
W69-04382

STATE OF TEXAS V CHUOKE (OWNERSHIP OF SUBMERGED LANDS).

154 F 2d 1-4 (5th Cir 1946).

Descriptors: *Judicial decisions, *Condemnation, *Beds under water, *Ownership of beds, Texas, Eminent domain, Federal government, Appropriation, State governments, Condemnation value, Oysters, Legislation, Bayous, Islands, Federal jurisdiction.
Identifiers: *Procedure.

This case involves the condemnation of submerged lands in Texas by the United States. The question to be resolved is how to distribute the money paid to the court as just compensation. The State of Texas claims title to the submerged lands and, therefore, feels that it is entitled to a part of the funds. The court found that the exclusive right to the submerged lands was given by the legislature to private individuals engaged in the harvesting of oysters. As a result, the court held that the state was not entitled to any part of the funds. (Stewart-Fla)
W69-04383

GEORGE V BEAVARK, INC (LAKE NAVIGABILITY FOR ADMIRALTY PURPOSES).

402 F 2d 977-981 (8th Cir 1968).

Descriptors: *Arkansas, *Non-navigable waters, *Admiralty, *Judicial decisions, Fishing, Navigation, Navigable waters, Lakes, Social function, Backwater, Dams, Federal jurisdiction, Legislation, Docks, Damages, Ships.

Petitioners were owners of a boat which caught fire and caused damage to docks. They sought to take advantage of federal limitation of liability statutes before the Federal District Court sitting in admiralty. In order to come within the statutes, the waters on which the accident occurred must have been navigable. Petitioners contended that the man-made lake was navigable because, prior to the construction of the dam, the river had been used for float fishing. The District Court noted the opinion of the Corps of Engineers that the river was non-navigable and denied the petition. In affirming, the Court of Appeals stated that if the river was navigable prior to the dam construction, it continued to be considered as a navigable stream, but ruled that float fishing was insufficient to show navigability. The Court said that the majority of jurisdictions hold that in order to be navigable, waters must be capable of practical general uses. (Wheeler-Fla)
W69-04384

STATE LAND NEEDED BY U S.
Mich Comp Laws Ann sec 3.301 (1967).

Descriptors: *Michigan, *Legislation, *Navigable waters, Navigation, Sea walls, Breakwaters, Piers, Federal government, State governments, State jurisdiction, Federal jurisdiction, Legal aspects, United States, Public lands, Water rights, Land tenure, Management.
Identifiers: Aids to navigation.

This statute authorizes the governor to convey title to and cede jurisdiction over state land covered by navigable waters to the federal government when such land is needed for federal use. The state shall retain concurrent jurisdiction for service of civil and criminal process thereon. (Helwig-Fla)
W69-04385

COUNTY ZONING.

Mich Comp Laws Ann sec 125.201 (1967).

Descriptors: *Michigan, *Legislation, *Zoning, *Local governments, Ordinance, Cities, Water conservation, Water supply, Administration, Regulation, Beach erosion, Shore protection, Oil, Natural gas, Drilling, State governments, Legal aspects.
Identifiers: *Setback lines.

This statute authorizes the county board of supervisors in any county to establish by ordinance, zoning districts outside the limits of incorporated cities for the purpose of regulating agriculture, forestry, recreation, residence, industry, trade, soil conser-

vation and water supply conservation. The board may also provide for setback lines in areas subject to beach erosion and may divide the county into districts in order to best provide such protection. (Helwig-Fla)
W69-04386

ANNEXATION OF SUBMERGED LANDS.

Mich Comp Laws Ann secs 123.581-123.583 (1967).

Descriptors: *Michigan, *Great Lakes, *Beds, *Boundaries (Property), Landfills, Ownership of beds, Islands, Local governments, Cities, Legal aspects.
Identifiers: *Submerged lands, *Annexation, *Submerged islands, Adjacent land.

Any incorporated city or village with a boundary on waters of any of the Great Lakes, shall have the power to annex submerged lands if adjacent to its boundary, the title to which is vested in a private owner pursuant to legislative act, which have no inhabitants, and are not at the time of the conveyance located in any township, city or village. If written consent is procured from the owner, annexation shall be accomplished by amending the charter of the city or village to extend the boundaries to include the land. Whenever any 'filled-in' submerged lands attached to and an extension of the upland have been in existence for more than 15 years, and any submerged islands not within any city or village but within 300 yards of the boundary shall be included within the boundary without annexation proceedings and shall also be within the boundaries of the county and other units of government. (Harris-Fla)
W69-04387

HOUSEBOATS, SANITATION AND LOCATION.
For primary bibliographic entry see Field 05G.
W69-04388

LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
For primary bibliographic entry see Field 04D.
W69-04389

SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.
For primary bibliographic entry see Field 05G.
W69-04390

THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.
For primary bibliographic entry see Field 05B.
W69-04391

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
For primary bibliographic entry see Field 05G.
W69-04392

GENERAL POWERS OF THE BOARD OF TRUSTEES.
For primary bibliographic entry see Field 04A.
W69-04393

DRINKING WATER SUPPLIES.
For primary bibliographic entry see Field 05F.
W69-04394

STATE SANITARY CODE.
For primary bibliographic entry see Field 05G.
W69-04395

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.
For primary bibliographic entry see Field 05G.
W69-04396

RIVERS AND STREAMS AS PUBLIC HIGHWAYS.

N Y Nav Law secs 120, 121, 122, 123, 124, 125 (McKinney 1968).

Descriptors: *New York, *Navigation, *Obstruction to navigation, *Navigable waters, Legislation, Waterways, Barriers, Dams, Bridges, Lumber industries, Condemnation, Riparian rights.
Identifiers: Public highways, Marking timber.

Dams and bridges erected over a river or stream recognized as a public highway are required to be constructed so as to allow the free and uninterrupted passage of lumber. For this purpose, dams must have an apron 15 feet wide. Persons operating booms or other obstructions must permit the passage of lumber. Those failing to allow such passage within 10 days after notice are liable to a penalty fine and damages. The rights of riparian owners on a river or stream recognized as a public highway may be condemned for running lumber by floating or flooding. Persons running lumber down any such public highway must record some individual mark to be placed on the lumber. This mark is presumptive evidence of ownership. Persons stopping or landing lumber are liable to the owner for all damages. The Hudson River, the Allegheny, Delaware, Oswegatchie, Grasse, Raquette, West Canada Creek, Black Rivers and their tributaries are not affected by this article. (Childs-Fla)
W69-04399

CONSERVATION LAW.
For primary bibliographic entry see Field 05G.
W69-04400

RIVER IMPROVEMENT.
For primary bibliographic entry see Field 04A.
W69-04401

ABANDONMENT OF CANAL LANDS.

N Y Canal Law secs 50, 51 (McKinney Supp 1968), 1 p.

Descriptors: *Legislation, *New York, *New York State Barge Canal, *Canals, Structures, Navigation, Transportation, Land use, Land development, State governments, Administrative agencies.
Identifiers: *Abandonment.

This article deals with the abandonment of canal lands. The first section confers authority upon the Commissioner of Transportation to abandon any portion of barge canal lands or terminal lands which have outlived their usefulness to the barge canal system. It also authorizes abandonment of structures that are no longer necessary as aids to navigation or for barge canal terminal purposes. However, this authority does not include abandonment of a barge canal terminal unless such terminal is declared to be no longer useful or necessary by a special act of the legislature. The next section describes the procedure to be followed before abandonment. It requires the Commissioner to publish notice and, if warranted, to hold a hearing. After issuing the official order of abandonment, the Commissioner shall file his report in his office. It shall describe what action was taken and the land involved. (Stewart-Fla)
W69-04402

FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.
For primary bibliographic entry see Field 04A.
W69-04403

WATER QUALITY MANAGEMENT AND CONTROL.
For primary bibliographic entry see Field 05G.
W69-04404

WATER FRONT IMPROVEMENTS.

N J Stat Ann secs 40:68-27 (Supp 1968); N J Stat Ann secs 40:68-28, 40:68-40, 40:68-41 (1967).

Descriptors: *Legislation, *New Jersey, *Erosion control, *Beach erosion, Shores, Administration, Tidal waters, Administrative agencies, Surveys, Cities, Condemnation.
Identifiers: Beach Erosion Control Commission, Elections.

Municipalities bordering on tidal waters may establish a beach erosion control district. Notice of the district to be created shall be posted in 2 public places setting forth the date of the hearing and the boundaries of the district. The ordinance setting up the district shall be approved by a majority vote on ballots printed specially for the election. The election shall be advertised at least one week in advance. Section 28 provides that if a Beach Erosion Control Commission is established it shall be known as ' (name of governing body) Beach Erosion Control Commission.' The Beach Erosion Control District, a public body politic and corporate having perpetual succession, is given power to: (1) adopt a seal; (2) sue and be sued; (3) provide for measures to prevent erosion; (4) enter into contracts; (5) borrow money and issue negotiable bonds; (6) acquire and dispose of property; and (7) employ agents necessary to carry out the purpose of this act. The district may enter onto lands or waters to make surveys, borings, soundings and examinations, and may bring condemnation suits. (Heckerling-Fla)
W69-04407

NORTH JERSEY DIST WATER SUPPLY COMM'N V CITY OF NEWARK (RESCISSION OF WATER SUPPLY CONTRACTS).

108 NJ Super 542, 248 A 2d 249-254 (1968).

Descriptors: *New Jersey, *Cities, *Supply contracts, *Judicial decisions, Legal aspects, Water costs, Water supply, Estimated costs, Water law, Legislation, Surveys.

Defendant City of Newark took action by resolution and ordinance to rescind a cooperation and a service agreement. Plaintiff, North Jersey District Water Supply Commission, brought action seeking a declaratory judgement that the contract was binding upon all parties. Pursuant to enabling legislation, plaintiff was to provide adequate water supply for various participating municipalities. Defendant entered into a cooperation agreement with plaintiff for future water provisions with costs to be determined by analytical surveys. Subsequently, defendant sought to rescind the agreement because of the vagueness of terms as to the cost determination. The court held that the agreement would be preserved. Both parties had had an opportunity to survey the costs. The defendant had entered the contract on his own volition, and the court's function was not to make better contracts for the parties. The court indicated that flexibility was necessary in long range water supply contracts. (Holt-Fla)
W69-04408

BEACH CONTROL: RULES AND REGULATIONS.
N J Stat Ann secs 40:185-4, 40:185-5 (1967).

Descriptors: *New Jersey, *Beaches, *Cities, *Administration, Legislation, Beach erosion, Shore protection, Recreation, Recreation facilities, Shores, Swimming, Easements, Local government.

Any city bordering on the Atlantic Ocean owning land or easement rights on land on the ocean shall have exclusive control and care thereof, including any boardwalk or facilities now or later constructed. Ordinances may be passed for the governing and policing of such lands and facilities, provided that any ordinance shall not interfere with state law. Any city may, in order to provide funds to maintain and police the ocean front and to protect it from damage or erosion by the sea, charge a reasonable fee for use of the beach by persons over 12 years of age. (Helwig-Fla)
W69-04409

LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
N J Stat Ann secs 40:179-120, 40:179-121 (1967).

Descriptors: *New Jersey, *Atlantic Ocean, *Recreation, *Public health, Public benefits, Cities, Land use, Natural resources, Recreation facilities, Condemnation, Legislation, Financing, Legal aspects, Eminent domain, Regulation, Maintenance.
Identifiers: *Resorts.

The governing body of a city bordering on the Atlantic Ocean has the right to acquire lands in that city which border on the ocean, by purchase or condemnation, for public purposes and for resorts for public health and recreation. The city may issue bonds in order to obtain the funds required for such undertaking. This act shall not take effect without the approval of a majority of the voters in the city affected. This approval may be obtained by note at either a special or annual election, and if approved, the act will take effect immediately. (Shevin-Fla)
W69-04410

ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.

N J Stat Ann secs 40:179-113 to 40:179-119 (1967).

Descriptors: *New Jersey, *Recreation, *Public health, *Financing, Atlantic Ocean, Public benefits, Cities, Legislation, Land use, Recreational facilities, Condemnation, Buildings, Construction, Parks, Erection, Taxes, Legal aspects, Eminent domain, Regulation, Maintenance, Roads.
Identifiers: *Resorts, Public grounds commission.

The governing body of a city bordering on the Atlantic Ocean may acquire lands in that city by purchase or condemnation for use as public places and resorts for public health and recreation. The city may finance the project by the issuance of bonds. After such lands are acquired, a public grounds commission shall be established. The commission shall have the power to erect public buildings on the grounds and shall have sole responsibility for supervision and control of all parks and public places. The Commissioners are charged with maintenance of the property and may perform any acts necessary to the discharge of this responsibility. In order to discharge the indebtedness contracted, and to secure funds for the construction and maintenance of buildings, pavilions, roadways, walks, and for the general improvement of the parks, the Commission may lease or rent any portion of the property. The city may assess taxes to cover interest and principal payments on bonds outstanding under this section and may also create a sinking fund for the subsequent redemption of these bonds if such a fund is not already in existance. (Shevin-Fla)
W69-04411

CONSTRUCTION OF CONVENTION HALL PIER.
For primary bibliographic entry see Field 04A.
W69-04412

BOARD OF PUBLIC WORKS.

N J Stat Ann secs 40:89-1 to 40:89-3 (1967).

Descriptors: *New Jersey, *Utilities, *Public works, *Sewage systems, Legislation, Electric powerplants, Water works, Administration, Community development, City planning.
Identifiers: *Board of Public Works, Mayor.

Section 40:89-1 provides that a board of public works may be set up by ordinance in all boroughs owning or operating a waterworks, sewage system, or disposal plans, or an electric lighting plant. Sec 40:89-2 provides that the mayor shall appoint, with the advice and consent of the council, six citizens of the borough, who, with the mayor, shall be known as the 'board of public works,' to hold office for 3 years. Two members shall be appointed each year. The mayor shall not vote except in case of a tie. Section 40:89-3 confers the following powers on the board: (1) the power to lay pipes for conveying water for public or private use; (2) the power to provide for sewerage and drainage of the borough; and (3) the power to provide for the lighting of streets and public places. The laws already in force pertaining to any of these powers shall continue in full force unless inconsistent. The board shall not have the power to authorize the issuing of bonds. (Heckerling-Fla)
W69-04413

HARBOR AND WATER FRONT COMMISSION; BEACH EROSION CONTROL DISTRICT.

NJ Stat Ann secs 40:68-22 to 40:68-26 (1967).

Descriptors: *Harbors, *Beach erosion, *New Jersey, *Legislation, Water law, Cities, Flood control, Port authority, Legal aspects, State governments, Local governments, Administrative agencies, Flooding.

Each municipality is authorized to create a harbor and waterfront commission. The commissions consist of seven persons appointed initially for terms of up to five years by the governing body of the municipality. The commissioners exercise power given them by municipal ordinance concerning the management of the harbor and waterfront of the municipality and the properties located thereon. Action by the commission involving over $500 requires the approval of the municipal governing body. If the municipality borders on tidal waters and is threatened by flooding, the municipal governing body may create a beach erosion control district consisting of lands that are or may be threatened by flooding. (Hoffman-Fla)
W69-04414

COUNTY SEWERAGE AUTHORITIES.
For primary bibliographic entry see Field 05G.
W69-04415

IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
For primary bibliographic entry see Field 03F.
W69-04416

BRIDGES OVER CERTAIN TIDAL WATERS; CHANGING COURSE OF STREAM.
For primary bibliographic entry see Field 04A.
W69-04417

STORMWATER SEWERS FOR COUNTY ROADS; MUNICIPAL COOPERATION.
For primary bibliographic entry see Field 04C.
W69-04418

PROTECTION OF ROADS NEAR TIDEWATER; ACQUISITION OF LANDS.
N J Stat Ann secs 27: 16-13, 27: 16-14 (1966).

Descriptors: *New Jersey, *Tidal waters, *Erosion control, *Condemnation, Legislation, Roads, Flood protection, Local governments, Roadbanks, Eminent domain, Ditches, Drainage, Legal aspects, Operation and Maintenance.

Procedures are provided whereby county freeholders may acquire land in order to prevent damage to county roads by tidewaters. Instead of acquiring such land, an agreement may be entered into with the landowner whereby he agrees to maintain the banks and ditches along, upon, and over the adjacent lands for the protection of county roads. (Childs-Fla)
W69-04419

HEALTH AND VITAL STATISTICS: COUNTY BOARD OF HEALTH.
For primary bibliographic entry see Field 05G.
W69-04420

MOSQUITO EXTERMINATION.
N J Stat Ann secs 26:9-1 to 26:9-12.9 (1964).

Descriptors: *New Jersey, *Mosquitoes, *Insect control, *Public health, Legislation, Inspection, Abatement, Spraying, Larvae, Water treatment, Administrative agencies, State governments, Regulation, Local governments, Breeding, Legal aspects, Surveys.
Identifiers: *Mosquito control.

This article deals with the control and elimination of mosquitoes and their breeding areas within the State. The first section provides for the establishment of a state experiment station. The director of the station shall survey all areas that he feels necessary in locating breeding areas. He shall map each section surveyed and indicate all breeding areas, the adopted method of extermination and the probable cost. In addition, the director, at the request of a local health board, shall survey any suspected territory and provide a map to the local board. Whenever doing a survey, the director shall notify the local board of health of a breeding area. The local board shall investigate the ownership and notify the owners to abate the breeding place. If the owner fails to comply, the local board shall abate the nuisance. The next provision deals with the budget of the state experiment station. The director may spend such amount for mosquito extermination as may be appropriated by the legislature. Finally, the article creates in the Department of Conservation and Economic Development a permanent commission known as the State Mosquito Control Commission. Its duty will be to make a continuous study of mosquito control and elimination within the state. It may also recommend to the legislature any desirable changes regarding legislation and appropriations. Furthermore, the commission may make recommendations to the director of the state experiment stations regarding breeding places and their abatement. (Stewart-Fla)
W69-04421

PUBLIC SWIMMING POOLS AND PLACES.

NJ Stat Ann secs 26:4A-1 to 26:4A-3 (1964).

Descriptors: *New Jersey, *Swimming pools, *Safety, *Regulation, Legislation, Recreational facilities, Control, Administrative agencies, Public health, Legal aspects.
Identifiers: Penalties.

This statute deals with the operation of a swimming pool or swimming area for profit. It dictates that the owner shall provide adequate and trained personnel for life-saving when the pool or area is open to the public. In addition, the statute also requires the owner to supply proper appliances for resuscitation during open hours. The statute empowers the State Department of Health to establish reasonable rules and regulations to carry out provisions of this act. Violations of this act are punishable by a fine of $50 for the first offense and $100 for each subsequent offense. (Stewart-Fla)
W69-04422

BRIDGES TO CONFORM TO WHARF LINES.
For primary bibliographic entry see Field 04A.
W69-04423

NUISANCES AFFECTING HEALTH.
For primary bibliographic entry see Field 05G.
W69-04424

DECLARATION AND ABATEMENT OF NUISANCES.
For primary bibliographic entry see Field 05G.
W69-04425

ATLANTIC STATES MARINE FISHERIES COMMISSION.

N J Stat Ann secs 32:21-1 to 32:21-11 (1963).

Descriptors: *Fish conservation, *Fish management, *Interstate compacts, *Interstate commissions, New Jersey, Atlantic Ocean, Marine fisheries, Legislation, Geographical regions, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Marine fish, Shellfish, Anadromous fish, Fish stocking, Fish eggs, Commercial fishing, Sport fishing.

The purpose of this compact is to promote the better utilization of the fisheries of the Atlantic Seaboard. The Atlantic States Fisheries Commission will be composed of representatives from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida. Any other state contiguous with the aforementioned states and riparian upon water frequented by anadromous fish may become a member. The agreement will become operative as to those states executing it whenever two or more states join in its execution. Each state joining shall appoint three representatives to sit on the Commission. The Commission shall make inquiries as to the best method for conserving the fisheries. It may recommend use of the police powers of the signatory states in order to preserve the fisheries and may make recommendation that the affected waters be stocked. The United States Fish and Wild Life Service shall assist in the Commission's endeavors, and an advisory commission composed of commercial fishermen and salt-water anglers shall be formed. The states shall make annual appropriations to support the commission. By consent of two states, the commission may be given authority to regulate the fishing operations and vessels of those states with respect to their fisheries. (Shevin-Fla)
W69-04426

INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
For primary bibliographic entry see Field 03D.
W69-04427

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.
For primary bibliographic entry see Field 05G.
W69-04428

HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).
For primary bibliographic entry see Field 04A.
W69-04429

ISLANDS IN DELAWARE RIVER.
N J Stat Ann secs 52:28-29 to 52:28-31 (1955).

Descriptors: *New Jersey, *Legislation, *Delaware River, *Islands, Pennsylvania, Interstate rivers, Interstate compacts, State governments, Legal aspects, Land tenure, Jurisdiction.

Commissioners from New Jersey and Pennsylvania met for the purpose of dividing the islands in the Delaware River, and an agreement was made which provides that: (1) the islands in the river are divided between the states according to this agreement; and (2) any islands which may be formed after the agreement will belong to the nearer state. (Heckerling-Fla)
W69-04430

OWNERS OF MARSH AND MEADOW LANDS.
N J Stat Ann secs 50:2-13 to 50:2-16 (1955).

Descriptors: *Legislation, *New Jersey, *Shellfish, *Gates, Clams, Riparian rights, Oysters, Ditches, Boats, Non-navigable waters, Locks, Ownership of beds, Legal aspects, Navigable waters, Relative rights.
Identifiers: *Obstruction to navigation.

Any person may plant oysters or clams on his property in creeks, ditches, or ponds, and such shellfish are to be deemed personal property. The owner of lands on which oysters or clams grow may erect a fence or gates across creeks or ditches to prevent any person from entering the same, however, such fences and gates cannot interfere with navigation. Any person trespassing by boat within the fences or gates shall be deemed guilty of violation of this chapter. No person shall have exclusive right to any natural oyster bed or ground. (Heckerling-Fla)
W69-04431

TIME, MANNER AND PURPOSE OF TAKING SHELLFISH.

N J Stat Ann secs 50:2-10 to 50:2-12 (1955).

Descriptors: *Legislation, *New Jersey, *Commercial shellfish, Dredging, Clams, Oysters, Tidal waters, Legal aspects, Regulation, Fish harvest, Boats.
Identifiers: Power boats.

The following rules are codified: (1) no power boat shall engage in the taking of shellfish from natural beds while under power except as otherwise provided under Section 50:3-6 of this Title; (2) no clams shall be taken by power boat, whereby the soil or bottom where the clams are found is agitated or disturbed by the propellor or other mechanically driven apparatus for the purpose of catching clams; (3) no oysters may be dredged or clams taken by instrument before sunrise or after sunset or on Sunday; and (4) no seed oysters or hard shell clams under one and one-half inches in length taken from natural beds shall be sold and taken out of the state for the purpose of planting on grounds in any other state. Possession of such shellfish outside of the state shall be prima facie evidence of violation of this section. (Heckerling-Fla)
W69-04432

ROUGH CULL LAW.

N J Stat Ann secs 50:2-7 to 50:2-8 (1955).

Descriptors: *Legislation, *New Jersey, *Commercial shellfish, *Oysters, Dredging, Clams, Beds, Shellfish, Fishing, Conservation, Legal aspects, Tidal waters.
Identifiers: *Culling.

New Jersey's Rough Cull law provides: (1) All oysters taken from any beds shall be culled as soon as they are emptied out of the tongs or dredges; and (2) No more than fifteen per cent of the material left after culling shall be shells. All shells except oysters and clams shall be immediately thrown back onto the beds or grounds. (Heckerling-Fla)
W69-04433

GENERAL POWERS AND DUTIES.

N J Stat Ann sec 50:1-5 (1955).

Descriptors: *Legislation, *New Jersey, *Shellfish, Commercial shellfish, Administrative agencies, Regulation, Legal aspects, Fish conservation, Resource development, Navigable waters, Non-navigable waters.

This section provides that The Board of Shell Fisheries shall have full control over the shellfish industry and the protection of shellfish throughout the state. It may make rules necessary for the preservation and improvement of the shellfish industry. It shall report annually to the legislature. (Heckerling-Fla)
W69-04434

BOARD OF GAME AND FISH COMMISSIONERS: POWERS AND DUTIES.
N J Stat Ann sec 23:2-3 (1940).

Descriptors: *New Jersey, *Wildlife management, *Wildlife conservation, *Fish stocking, Legislation, Animals, Fish, Birds, Natural resources, Conservation, Hatching, Streams, Administrative agencies, Administration.
Identifiers: *Board of Fish and Game Commissioners.

The powers and duties of the Board of Fish and Game Commissioners include: (1) insuring the protection and propagation of fish, birds and game animals, and enforcing the laws relating thereto; (2) stocking streams and closing them for 48 hours thereafter; (3) controlling all hatching stations owned by the state; (4) investigating any complaint concerning any illegal apparatus for taking fish, removing the same, and arresting and prosecuting the offender; (5) reporting to the legislature annually on all official operations, making suggestions and recommendations. The Board may stock with fish or game only water or land open to all licensed anglers and hunters or specifically designated public sanctuaries. The Board may stock water under control of the Boy Scouts, Y.M.C.A., Y.W.C.A. or other public organizations during camp operations. (Helwig-Fla)
W69-04435

LITTERING AND OBSTRUCTIONS,
Interstate Commission on the Potomac River Basin, Washington, D. C.
Wayne W. Bridges.
In PROBLEMS OF THE POTOMAC ESTUARY, January 1964, pp 57-59.

Descriptors: *Maryland, *Virginia, *Legislation, *Wastes, *Floating, Aquatic drift, Driftwood, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Regions, Southeast U. S.

This report defines the problem of floating debris in the Potomac Estuary. Legislation relating to the prevention and control of littering is discussed.
W69-04450

POLITICS AND THE MARINE FISHERIES,
W. M. Chapman.
In FISHERIES OF NORTH AMERICA, First North American Fisheries Conference, Proceedings, 1965, pp 8-16.

Descriptors: *Marine fisheries, *Oceanography, *Legislation, *Political aspects, *Federal government, Commercial fishing, Competition, Productivity, Natural resources, Fisheries, Oceans, Fishing, Industries, Legal aspects, Regulation, Water law, Federal jurisdiction, Jurisdiction, State jurisdiction, Relative rights, Governments, Water policy, Water rights, State governments, Profit, Foreign countries, Geographical regions, Regions, Resources, Water resources development, Bodies of water, Surface waters.

Reasons for the inability of the United States to compare favorably with other countries in fisheries are presented. One of these reasons is that most of

our fishing regulations are at the state level and are based on such a variety of complex and sometimes involved conflicts that it is impossible to determine the effects of this legislation without extensive legal, economic, social, and resource research on the state level. It is suggested that a Department of the Ocean be established, with a Secretary of Cabinet rank, which will coordinate within the United States all aspects of oceanography, including fisheries.
W69-04455

MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-04578

ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM: THE RHONE,
Compagnie Nationale du Rhone (France).
For primary bibliographic entry see Field 04A.
W69-04592

ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
Office for Scientific and Technical Research Overseas, Paris (France).
J. A. Rodier.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash D C, Vol 5, pp 804-809, 1968. 6 p.

Descriptors: *Organizations, *Administrative agencies, *Surveys, Soil surveys, Climatic data, Hydrologic data, Training.
Identifiers: *French West Africa, ORSTOM.

For 20 years ORSTOM (Office de Recherche Scientifique et Technique d'Outre Mer) has had responsibility for the major portion of the studies made in the departments and former French overseas territories and in other developing tropical or Mediterranean States. Often no hydrological study had been made before the arrival of ORSTOM. The general research policy followed by ORSTOM is to have a flexible, realistic attitude, closely linked with the development needs, and to follow closely order of priority. The acquisition of basic data must have top priority. The organization and exploitation of the basic network must be carried out concurrently with the initial research. The study of representative basins must make up for the briefness of network observations. The existing rainfall data should be used as well as the implementation of a minimum program of basic research on evaporation and percolation. The practical studies that can serve to channel the research programs and furnish additional means for carrying on this research must not be neglected. Equipment and methods should be completely adaped to all working conditions. The program should not neglect the training of native personnel who, according to plan, are to take over gradually from the foreign experts. (Vorhis-USGS)
W69-04614

NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
Guillermo J. Cano.
International Conference on Water For Peace, Vol 5, pp 3-17 (1968). 15 p, 14 ref. For 8-volume proceedings see Vol 2, No 9, Field 06B, W69-03305.

Descriptors: *Legislation, *Legal aspects, *Administration, *Water policy, United States, State governments, Water law, Interstate rivers, International law, Groundwater, Federal government, Water allocation (Policy), Water control, Legal aspects.
Identifiers: International water development.

Standard water law models cannot be formulated to serve the entire world since physical conditions and legal systems are too widely varied. Interdisciplinary study is recommended for water law experts. Water law should be flexible. Legal reform which affects existing water rights can be accomplished by the payment, in certain instances, of compensation for divested rights. International watersheds should be taken into account when national water policy is being formulated. Watersheds do not coincide with artificial political boundaries. The approach of different countries to the problem of interjurisdictional rivers is discussed. Ideal water legislation and its relationship to legislation dealing with other natural resources, and the concept of water ownership are commented upon. Finally, water rights, water uses, and groundwater are discussed. (Williams-Fla)
W69-04644

ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
C. A. Cocks, and T. Waara.
International Conference on Water for Peace, Vol 5, pp 359-364 (1968), 6 p, 1 chart. For 8-volume proceedings see Vol 2, No 9, Field 06B, W69-03305.

Descriptors: *Missouri River, *Agricultural watershed, *River basin commissions, *River basin development, United States, Watersheds (Basins), Missouri, Kansas, Colorado, Iowa, Nebraska, Wyoming, Minnesota, South Dakota, North Dakota, Montana, River basins, Rainfall, Irrigation, Flood protection, Reservoirs, Regulated flow, Navigation, Hydroelectric power, Engineering, Storage, Tributaries, Economic prediction, Legal aspects.
Identifiers: Missouri River Basin, Dept of Agriculture, Corp of Engineers, Dept of Labor, Federal Power Commission, Missouri Basin Inter-Agency Committee.

The Missouri River Basin spreads over 529,000 square miles. Through extensive cooperation between seven key federal water resources agencies and the ten basin states, great strides have been made to control the waters of the Missouri River. Systems of agricultural levees to protect agricultural lands and the major cities located along the river have been constructed. Hydroelectric plants have been built along with flood protection projects. The effective coordination between the federal agencies and the states has been achieved through the Coordinating Committee of Missouri River Stem Operations which is made up of the chief water resources engineer of each state and a member of each federal agency involved. This preserves to each state the opportunity to represent its own interests. The value of the group has been amply demonstrated, and long term planning is currently underway. (Shevin-Fla)
W69-04645

FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
For primary bibliographic entry see Field 06B.
W69-04646

ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
Harley F. Lawhead.
International Conference On Water For Peace, Vol 5, pp 139-148, Washington, 1968. 10 p. For 8-volume proceedings see Vol 2, No 9, Field 06B, W69-03305.

Descriptors: *Lake Ontario, *Treaties, *International Joint Commission, *Flow control, Administrative agencies, Administration, St Lawrence River, Flow measurement, Regulation, Water levels, Hydroelectric power, Legal aspects.

Pursuant to the Boundary Waters Treaty of 1909 the United States and Canada entered into an agreement in 1952 to provide for the development of power sources in the International Rapids Section of the St Lawrence River. Such development is accomplished through the regulation of the outflows of Lake Ontario. The mechanics of this regulation are discussed. The order of the International Joint Commission authorizing the power project established a Board of Control to oversee the project. Its duties and membership are discussed. Four subordinate organizations and their duties are discussed. The Board of Control is to provide technical determinations and reviews, and to monitor the regulation of Lake Ontario. It also reviews applications by power entities seeking variation of the flow. (Williams-Fla)
W69-04648

WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
Harold H. Ellis.
International Conference On Water For Peace, Vol 5, pp 649-667, Washington, 1968. 18 p, 66 ref. For 8-volume proceedings see Vol 2, No 9, Field 06B, W69-03305.

Descriptors: *Water rights, *Water law, *Riparian rights, *Relative rights, Navigable waters, Percolating water, Surface runoff, Underground streams, Contracts, Federal government, Groundwater, Appropriation, Stream flow, Impoundments, Water pollution, Condemnation, Public rights, Shores, Federal-state water rights, Conflicts, Local governments, Dams, Water pollution control.
Identifiers: Natural watercourses, Water use permit systems, Access.

The general legal rules dealing with water supply use in the eastern states are determined by state courts and by state, and, to a lesser extent, by federal legislation. Natural water supplies are classified in legal terms as natural watercourses, diffused surface water, percolating groundwater, and underground streams. The ownership and use of these water supplies is determined by riparian doctrine, navigability, and contractual agreements. Legislation dealing with water rights is increasingly necessary. This legislation is vital because of the decline of the relative water abundance in the eastern states which has resulted in expanding water use conflicts. Some methods of legislative control include water use permit systems, minimum streamflows or lake level requirements, pollution control measures, and preferential and condemnation provisions. Many problems have begun emerging, including: (1) the respective roles of courts, governments, and administrative agencies; (2) private and public rights; and (3) the coordination of water allocation and pollution control. (Hoffman-Fla)
W69-04649

CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).

402 F 2d 739-748 (10th Cir 1968).

Descriptors: *River beds, *Oklahoma, *Ownership of beds, Rivers, Arkansas, Boundaries (Property), United States, Navigable waters, Natural resources, Legal aspects, Judicial decisions, Treaties, Indian reservations, Mississippi River, Jurisdiction, Tides, Surveys, Fisheries.
Identifiers: *Arkansas River, *Indians, Grand River, Canadian River, Injunctions.

The Cherokee, Choctaw, and Chickasaw Indian Tribes in Oklahoma all claimed title to the bed of the Arkansas River. The state of Oklahoma made a similar claim. The Indians brought suit, praying for an injunction against use of the river bed by Oklahoma. The question was whether certain treaties between the Indians and the United States conveyed ownership of the bed to them. In the treaties granting the Indians certain areas as reservations, no mention was made of the beds of the rivers located therein. The court held that the omission of

any mention of ownership of river beds did not show intent to pass ownership to the Indians. Congress had provided that all states, upon entering the union, acquired ownership of the river beds within their borders. The court held that Oklahoma entered the union on equal footing with the original 13 states, and thus title to the bed in question was rested in the state of Oklahoma. (Shevin-Fla)
W69-04651

BURGESS V PINE ISLAND CORP (LAND SEPARATED FROM ISLAND BY NON-NAVIGABLE STREAM NOT AN ISLAND).

215 So 2d 755-759 (2d DCA Fla 1968).

Descriptors: *Florida, *Islands, *Boundaries (Property), *Non-navigable waters, Judicial decisions, Legal aspects, Navigable waters, Watercourses, High water mark, Low water mark, Boundary disputes.
Identifiers: Deeds.

Defendant, Pine Island Corporation, had received a warranty deed for all of fractional section 36 on the mainland of Pine Island. The plaintiff had obtained a quit claim deed to all of fractional section 36 other than that located on the mainland of Pine Island. A 70-acre tract of land located southeast of plaintiff's land was in dispute. This tract was clearly separated from plaintiff's land by a watercourse. A smaller watercourse ran between the tract and defendant's land. Plaintiff contended that the tract should be classified as an island and included in the lands conveyed to him. The watercourse separating the tract from defendant's land was navigable only at high tide and had a depth of only a few inches at low tide. The court found the watercourse in question to be non-navigable since it did not consistently have a capacity for navigation. The court alluded to that quality which might be termed 'permanency' as being characteristic of those land masses properly called 'islands.' The fact that the land in question is surrounded by water during some periods is not determinative. The court held that the tract in question was part of the mainland and thus belonged to defendant. (Shevin-Fla)
W69-04652

POWERS OF CITIES.

N Y General City Law secs 20 (2), 20 (8), 20 (8a) (McKinney 1968).

Descriptors: *New York, *Cities, *Drainage, *Navigation, Legislation, State governments, Local governments, Sewers, Storm drains, Condemnation, Sewage disposal, Sewage, Water supply, Flood control, Right-of-way, Bridges, Beds, Navigable waters, Docks, Piers, Diversion, Landfills, Public benefits.

Cities may obtain and hold real and personal property within or without the city limits. They may condemn real property for the construction, maintenance and operation of sewage disposal plants, water supply systems, and drainage channels and structures for flood control, as well as all necessary rights-of-way for the above projects, and for any public or municipal purpose. Land so obtained may be sold or conveyed, but the rights of a city in and to its waterfront, ferries, bridges, wharves, submerged lands, streets, parks and all other public places are inalienable, except where specifically permitted in this section. Cities may control the waterfront and waterways of the city, and may establish, operate and regulate docks, piers, wharves, warehouses and all adjuncts and facilities for navigation and commerce and for the utilization of the waterfront, waterways and adjacent property. Cities may control filling and diversion of watercourses, except when authorized by a state or federal agency, by requiring that permits be obtained before such activities are commenced. Such permits may be denied if the city determines that the proposed filling or diversion is detrimental to the drainage or welfare of the city. (Scott-Fla)
W69-04657

PUBLIC NUISANCE DEFINED.
N Y Penal Law sec 1530 (McKinney 1968).

Descriptors: *New York, *Public health, *Safety, *Navigation, Legislation, Public rights, State governments, Navigable rivers, Navigable waters, Barriers, Reasonable use, Lakes, Streams, Bays, Canals, Basins, Creeks, Dredging, Legal aspects.
Identifiers: Penalties (Criminal).

A 'public nuisance' is a crime against the order and economy of the state. Public nuisance consists of doing, or omitting to do, an act that annoys, injures or endangers the health, safety, repose or comfort of a considerable number of persons; unlawfully interferes with, obstructs, or tends to obstruct, or renders dangerous for passage a lake, navigable river, stream, bay, canal or basin, or a stream, creek or other body of water which has been dredged or cleared at public expense, or a public park, square, street or highway; offends public decency; or in any way renders a considerable number of persons insecure in life or the use of property. (Scott-Fla)
W69-04660

INTERFERING WITH NAVIGATION.

N Y Penal Law sec 1505 (McKinney 1968).

Descriptors: *New York, *Legislation, *Navigable waters, *Navigation, Public rights, State governments, Safety, Bays, Sounds, Harbors, Boats, Depth, Legal aspects.
Identifiers: Penalties (Criminal).

Anyone who throws, or causes, or permits to be thrown any ashes, earth, cinders, stone or other material from any boat or vessel into any navigable waters of the state, or who builds any structure therein that would in any way lessen the depth of such water or interfere with its free and safe navigation, is guilty of a misdemeanor. (Scott-Fla)
W69-04661

LITTLE V UNITED STATES (WRONGFUL DEATH LIABILITY FOR DAM MAINTENANCE).

290 F Supp 581-588 (E D La 1968).

Descriptors: *Louisiana, *Federal government, *Dams, Rivers, Damages, Canals, United States, Operation and maintenance, Dam construction, Boating, Judicial decisions, Legal aspects.
Identifiers: *Wrongful death, Assumption of risk, Contributory negligence, Suits in admiralty act, Corps of Engineers.

Plaintiff brought an action for the wrongful death of her husband. The decedent was drowned in a river across which the Corps of Engineers had erected a sill to back water into a nearby canal. Warning signs were up in the area of the sill, which completely obstructs navigation on the river and causes a five foot drop on its downstream side. Decedent, who was familiar with the sill and the swift currents in the stream, used a hoist, which had been erected on one side of the sill by unknown persons, to raise his boat up over the drop. This operation completed, the decedent attempted to propel his boat upstream stern first. The swift current forced the boat back and over the sill; the boat sank and decedent drowned. The court held for the defendant, ruling that decedent had been warned regarding the dangerous conditions created by the sill. In proceeding as he did, Plaintiff's intestate assumed the risk or was contributory negligence, thus barring plaintiff's claim. Defendant had no duty to construct a portage around the sill. The question of whether defendant was negligent in failing to remove the hoist is not relevant in this case since such failure was not the actual or proximate cause of the accident. (Molica-Fla)
W69-04666

HUNTER V CITY OF SHREVEPORT (BRIDGE CONSTRUCTION).

216 So 2d 140-145 (Cir Ct App La 1968).

Descriptors: *Louisiana, *Water supply, *Pollution, *Bridge construction, Judicial decisions, Legal aspects, Governments, Reservoir storage, Public health, City planning, Highway effects, Lakes, Water pollution, Cities, Local governments, Eminent domain.

Plaintiffs, taxpayers of defendant city and consumers of water supplied by defendant sought to enjoin construction of a proposed highway bridge over a lake which was the primary source of water for the city. Several of the plaintiffs were owners of property which would be affected by the construction. Defendant obtained title to the lake bed from the state for the purpose of providing pure and wholesome water for its citizens. The lower court ruled against plaintiffs' contentions that the route selected by the defendant state highway department was arbitrary and unreasonable and constituted a threat to the health of the city's inhabitants by creating a danger of pollution. On appeal, the court held that the possibility of vehicular accidents on the bridge resulting in noxious materials being dumped into the lake is too ideal and unrealistic. The proposed construction would merely add to the dangers of pollution which presently exist from other sources. The city considered the additional hazards of pollution which would result from the construction and plaintiffs have not shown that its decision was arbitrary or capricious or that the trial court abused its discretion in finding for the defendants. (Molica-Fla)
W69-04667

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).
For primary bibliographic entry see Field 05G.
W69-04668

TOWN OF HEMPSTEAD, LIDO BEACH, NASSAU COUNTY (CONDEMNATION AWARDS).
294 N Y S 2d 809-813 (Sup Ct 1968).

Descriptors: *New York, *Condemnation value, *Accretion (Legal aspects), Judicial decisions, Legal aspects, Condemnation, Compensation, Cities, Governments, Interests, Interest rate, Local governments, Eminent domain.
Identifiers: Condemnation awards.

Claimant owned property which was condemned by petitioner municipality for the purpose of developing a recreational park within the town limits. Petitioner objected to a court finding that .59 more acres of land than shown upon petitioner's taking map were confiscated due to the accretion of material onto claimant's land. The court held that because there was an accretion to claimant's land between December, 1965, and December, 1966, and the de facto taking of claimant's land occurred on June 15, 1966, and there is no engineering study to indicate how much of this accretion existed on the date of the taking, that it will be inferred that one half of the accreted land was in existence at the date of the taking. The court also found that a 10% increment to the condemnation award was proper since the comparable sales used to arrive at the amount of the award did not reflect the increased value of the land due to a zone change. The State must pay 6% interest in condemnation proceedings and it would be unconstitutional for petitioner, a subdivision of the State, to pay 4%. (Molica-Fla)
W69-04669

DEPARTMENT OF HIGHWAYS OF LOUISIANA V UNITED STATES (REVOCATION OF BRIDGE PERMIT).

159 F Supp 341-345 (Ct Cl 1958).

Descriptors: *Federal government, *Navigable waters, *Bridges, *Permits, Legislation, Judicial decisions, Administrative agencies, Administrative decisions, State governments, Bridge construction, Channels, Legal aspects, Damages, Contracts, Compensation, Cost repayment.
Identifiers: Commerce clause, Due process.

The Louisiana Department of Highways applied to the federal government for permission to construct a bridge across the Gulf Intercoastal Waterway. Pursuant to the General Bridge Act of 1946, the plans were approved, and a certificate authorizing a certain type of bridge in a certain place was authorized. Several months after construction was begun, however, plaintiff was notified that work should be stopped. A second permit was signed, authorizing construction of a different type of bridge in a different place. Plaintiff filed suit, claiming as damages the costs already incurred in construction of the bridge. It was contended that the first certificate created a contractual relationship between the parties and that subsequent revocation of such certificate constituted breach of contract. It was also contended that this action by the government was tantamount to taking of property, for which the fifth amendment required just compensation. The court found for the United States, holding that the certificate did not constitute a contract and that there was no unconstitutional deprivation of property. Congress may legislate concerning bridge construction over navigable waters pursuant to its power to regulate interstate commerce. (Williams-Fla)
W69-04670

UNITED STATES V REPUBLIC STEEL CORP (INJUNCTION TO FORCE COMPANY TO RESTORE RIVER TO ORIGINAL DEPTH).

155 F Supp 442-454 (ND Ill 1957).

Descriptors: *United States, *Industrial wastes, *Dredging, *Depth, Illinois, Judicial decisions, Rivers, Industries, Navigable rivers, Navigation, Obstruction to flow, Rivers and Harbors Act, Legal aspects, Legislation.

The United States brought suit against defendants seeking an injunction against continued discharge of industrial solids into the Calumet River without a permit from the Department of the Army. The suit also sought to secure a mandatory injunction requiring defendants to dredge the river to its original depth. The United States alleged that defendant's activities were in violation of sections 10 and 13 of the Rivers and Harbors Appropriation Act of 1899 (33 USCA, secs 403 and 407). The court held the Illinois statute of limitations inapplicable and found that the evidence established that defendants were responsible at least to some degree, for reduction in the river's depth. The court established a formula for payment by defendants of the dredging costs and, after reciting its findings of fact and conclusions of law, issued the orders prayed for. (Williams-Fla)
W69-04671

CAPITAL V PORT WASHINGTON YACHT CLUB (ACTION FOR LATERAL SUPPORT OF LAND, WITH ADDITIONAL CLAIMS FOR SURFACE WATER DAMAGE).
172 N Y S 2d 78-82 (S C 1958).

Descriptors: *New York, *Reasonable use, *Obstruction to flow, *Land development, Surface waters, Surface runoff, Damages, Natural flow, Judicial decisions, Water law, Slopes, Backfill, Surface drainage, Mudflows, Legal aspects, Alteration of flow, Relative rights.
Identifiers: Negligence.

Plaintiff and defendant were adjoining landowners. Defendant removed part of a hill which sloped from plaintiff's property in order to provide additional parking facilities for his yacht club. Plaintiff sued to require defendant to furnish lateral support to his land and for damages resulting from an earth buildup around his swimming pool and from surface waters which were thrown back on his land, allegedly as a result of defendant's excavations. Defendant counterclaimed for damages due to plaintiff's alteration of the natural contour of his land in preparation for real estate development, which alteration caused water, mud, and debris to be discharged on defendant's property. The court ruled that plaintiff could maintain the support action but dismissed both water damage claims. The court held that defendant was not liable for improving and grading his land even though the effect of such activities was to repel and reject surface waters which formerly flowed across it. Defendant's counterclaim was dismissed, the court finding that plaintiff was not negligent in preparing his land for building operations. (Wheeler-Fla)
W69-04672

MALONE V CUSTOM MANOR (PRIVATE WATER LINES).

158 N Y S 2d 241-247 (S C 1956).

Descriptors: *New York, *Water contracts, *Water conveyance, *Public utilities, Community development, Judicial decisions, Water supply, Water rates, Pipes, Water districts, Water distribution (Applied), Legal aspects, Regulation.

Plaintiffs purchased property from the defendant, a real-estate developer. At the time the deeds were delivered, the parties executed contracts which provided that the defendant would supply water to the plaintiffs at a specific rate until the defendant's private water line was purchased by and transferred to a water district. Plaintiffs sought an injunction against collection of payments under the contract and a declaratory judgment that the contracts were void. Plaintiffs alleged that the defendant was in the business of transportation or distribution of water for a fee without having complied with the provisions of the Transportation Corporations Law and the Public Service Law. The court found that those laws did not apply to defendant since it merely installed a pipeline through which water might be temporarily supplied, without profit, to those to whom the defendant had sold houses, and not to the public generally. The water line continued to be defendant's private property, subject only to the rights granted to plaintiffs. Since the business was not affected with the public interest, it was not subject to public regulation. (Scott-Fla)
W69-04675

WAGNER V CITY OF BALTIMORE (NAVIGABLE RIVER BEDS).
124 A 2d 815-821 (Ct App Md 1956).

Descriptors: *Maryland, *Ownership of beds, *Patents, *Islands, Navigable waters, Navigable rivers, River beds, Non-navigable waters, Tidal waters, Riparian rights, Riparian land, Legislation, Rivers, Bank accretion (Legal aspects), Alluvium, Alluvial channel, Legal aspects.
Identifiers: Navigable-in-fact.

The City of Baltimore issued a patent for an island in the Patapsco River to defendant's successors in title. The city brought action to set aside the patent, such action being based on a statute prohibiting the issuance of a patent if the lands are covered by navigable waters, or if such issuance would impair the riparian rights of landowners. The court found that although the island had been building up for a long period in 1909, it was submerged at mean low tide. Where a river is navigable lengthwise, all the waters between the opposite shores are navigable waters. Navigable channels ran on both sides of the island making the entire river bed 'lands under navigable water.' The court discussed, but found it unnecessary to decide, which test was used to determine navigability. The water could recede entirely from alluvium, and at that point, the island would become connected with the shore. This would impair the riparian rights of the shore owner. Thus the patent is violative of the statute. (Helwig-Fla)
W69-04679

FRYE V PENNSYLVANIA RAILROAD CO (RAILROAD'S LIABILITY FOR NEGLIGENTLY MAINTAINING CULVERT THROUGH RIGHT-OF-WAY).

39 WESTMORELAND L J 169-174 (CP Pa 1957).

Descriptors: *Culverts, *Pennsylvania, *Streams, *Obstruction to flow, Judicial decisions, Legal aspects, Right-of-way, Water law, Ditches, Drainage, Damages, Erosion.
Identifiers: Negligence.

Plaintiff brought action in tort against defendant railroad to recover for damage done to plaintiff's real and personal property. Defendant owned right-of-way across plaintiff's property. A culvert was erected on the right-of-way to allow drainage of a natural watercourse flowing through the property. Said culvert was not maintained by defendant and subsequently became clogged, causing water to accumulate and damage plaintiff's property. The court held that it was defendant's duty to properly maintain the culvert; failure to adequately maintain the culvert rendered defendant liable for resulting damage. The damage awarded was an amount required to restore plaintiff's real and personal property to its previous condition, but limit by the fair market value of the property. (Holt-Fla)
W69-04683

CAMPBELL BROWN CO, INC V ELKINS (RIVERBED OWNERSHIP).

93 S E 2d 248-268 (Sup Ct App W Va 1956).

Descriptors: *West Virginia, *Navigable rivers, *Ownership of beds, *Dredging, Judicial decisions, Riparian rights, Coal mines, Legal aspects, River beds, Mineral industries, Mine wastes, Mining, Legislation, Relative rights, State governments.

Defendant conducted a coal dredging operation on the bed of a river which was included in the letters patent to his remote grantor. Plaintiff, conducting coal dredging operations downstream pursuant to a license subsequently granted by the State, sought to restrain defendant's operation which interfered with his dredging. The court held that a legislative act passed subsequent to the grant of the patent to defendant's grantor vitiated any title given to navigable river beds. By virtue of public policy the title to all navigable river beds is in the State and as such are not within the meaning of the section of the constitution dealing with forfeited, waste, and unappropriated lands. The river was at one time navigable and in law it will always remain so. To be such, a river does not have to be continually and easily navigable. The coal being distracted from the river bed is coal discarded from an upstream coalfield and is therefore abandoned property, title to which is in the State. (Molica-Fla)
W69-04691

DECLARATION OF POLICY.
N Y Conserv Law sec 401 (McKinney 1967).

Descriptors: *New York, *Water resources, *Water conservation, *Public benefits, Legislation, Recreation, Storage, Agriculture, Domestic water, Municipal water, Public health, Water pollution, Irrigation water, Beneficial use.
Identifiers: *Public policy.

The public policy of the state in reference to the control of its water resources shall be as follows: (1) the regulation of water resources shall be exercised pursuant to the laws of the state; (2) waters shall be conserved for all public beneficial uses; (3) planning shall be undertaken for the conservation and development of the water resources, and resources shall not be wasted; (4) consideration

shall be given to the relative importance of different uses of the waters; (5) acquisition, storage, diversion and use of water for domestic and municipal purposes shall have priority; (6) alterations in the conditions of the waters shall be carried out in a manner that least impairs the important uses; (7) reasonable standards of purity must be maintained and wildlife and fish protected. The use of all known available and reasonable methods to prevent and control pollution, wastage and unreasonable disturbances and defilement of the waters shall be required; (8) and the regulated acquisition, storage, diversion and use of water for the supplemental irrigation of agricultural lands within the state is a public purpose and use, in the interests of the health, safety and welfare of the people of the state. (Shevin-Fla)
W69-04694

DELAWARE RIVER.

N J Stat Ann secs 52:28-23 to 52:28-26 (1955).

Descriptors: *New Jersey, *Legislation, *Delaware River, *Interstate compacts, Pennsylvania, Interstate rivers, State governments, State jurisdiction, Islands, Ships, Shores, Legal aspects, Regulation.
Identifiers: Islets, Penalties (Criminal).

The Commissioners of New Jersey and Pennsylvania have agreed to, and New Jersey has codified, the following provisions: (1) An agreement settling the jurisdictional questions relative to the Delaware River and islands within it; and (2) because of the uncertainty over the jurisdiction of the river, the following rules were established: (A) The Delaware River is a common highway equally free and open to both states. Each legislature may regulate fisheries on the river annexed to their respective shores; (B) Each state shall have concurrent jurisdiction upon the water. Each anchored vessel shall be considered exclusively within the jurisdiction of such state; every vessel aground or fastened to the shore shall be within that state. All crimes, trespasses or damages committed on the river shall be within the jurisdiction of the state where the wrongdoer is first apprehended, arrested, or prosecuted; (C) Islands, islets, and dry lands in the river belong to the state to which they lie nearer. However, certain islands are excepted from this rule. (Heckerling-Fla)
W69-04699

EQUITABLE GAS CO V ROCCA (RIGHTS OF LANDOWNER TO CONSTRUCT A RESERVOIR OVER AN EASEMENT ON THAT LAND).

35 Wash Co 25, 6 D and L 2d 453-465 (C P Washington County Pa 1954).

Descriptors: *Easements, *Right-of-way, *Reservoir construction, *Reasonable use, Pennsylvania, Judicial decisions, Flooding, Pipelines, Floodgates, Locks, Reservoirs, Relative rights, Legal aspects, Operation and maintenance.
Identifiers: Ingress, Egress, Injunctions (Prohibitory).

Plaintiff, holder of an easement across defendant's property, sought a permanent injunction prohibiting the flooding of part of the property to form a reservoir. Such reservoir would completely cover plaintiff's pipeline. The court recognized plaintiff's right of ingress and egress to and from his pipeline for purposes of operation and maintenance. It also recognized defendant's right of the free use of his property and the utility to the defendant. Due to the fact that defendant agreed to construct the reservoir with floodgates or locks enabling him to drain the reservoir within five hours, the court refused to permanently enjoin construction since the correlative rights of both parties would be protected by such drainage feature; the plaintiff would have adequate access rights and defendant would be enabled to construct his reservoir. (Logan-Fla)
W69-04700

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, KERN RIVER, KERNVILLE, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 04A.
W69-04216

FLOOD PLAIN INFORMATION, PAYETTE RIVER, PAYETTE, IDAHO AND VICINITY.
Corps of Engineers, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W69-04219

FLOOD PLAIN INFORMATION, SANTA CLARA RIVER (SATICOY TO PACIFIC OCEAN), VENTURA COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W69-04220

FLOOD PLAIN INFORMATION, JOHNSON CREEK, ARLINGTON AND GRAND PRAIRIE, TEXAS.
Corps of Engineers, Fort Worth, Tex.
For primary bibliographic entry see Field 04A.
W69-04221

FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 04A.
W69-04249

STATEMENT,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W69-04306

THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
Federal Water Pollution Control Administration, Department of Interior, Southeast Region, Atlanta, Ga.
Eugene P. Odum.
In CLEAN WATER FOR THE NATION'S ESTUARIES, Proceedings of the Georgia Public Meeting, Jekyll Island, Georgia, November 29, 1968, p 4.

Descriptors: *Ecosystems, *Multiple purpose, *Zoning, *Competing uses, Water utilization, Regulation, Efficiencies.

The article is a 'plea for a package of three basic approaches in regard to estuaries: (1) Consideration of the estuarine landscape as one major ecological system (ecosystem) with inter-dependent components and functions; (2) Recognition by professionals and the public alike of the basic ecological laws that result in conflict between 'man' and 'nature' as the first step in resolving multi-purpose conflicts; (3) Need to establish immediately a ground swell of public opinion for landscape zoning as the only practical solution to desired multiple use objectives which must involve both preservation and use.'
W69-04307

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
A. H. Underhill.
A Symposium on Estuarine Fisheries, American Fisheries Society, Special Publication No. 3, 1966, pp 127-129.

Descriptors: *Land reclamation, *Zoning, *Legislation, *Estuarine environment, Management, Planning, Regulation, Governments.

This paper presents a brief general discussion of different means of accomplishing preservation of valuable estuarine areas by a representative of the U. S. Bureau of Outdoor Recreation. The means which the author suggests as having merit are '(1) public ownership, (2) zoning, (3) comprehensive planning by interagency groups, and (4) legislation, at all levels of government, to support zoning, comprehensive planning, and other necessary actions'.
W69-04512

FLOOD PLAIN INFORMATION, RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN.
Corps of Engineers, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W69-04529

FLOOD PLAIN INFORMATION, SNAPFINGER CREEK, DEKALB COUNTY, GEORGIA.
Corps of Engineers, Savannah, Ga.
For primary bibliographic entry see Field 04A.
W69-04530

FLOOD PLAIN INFORMATION, CLEARWATER RIVER, OROFINO AND RIVERSIDE, IDAHO.
Corps of Engineers, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W69-04531

FLOOD PLAIN INFORMATION, MILL RIVER, HAMDEN, CONNECTICUT.
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 04A.
W69-04532

FLOOD PLAIN INFORMATION, TULE RIVER, SPRINGVILLE, CALIFORNIA.
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 04A.
W69-04533

FLOOD PLAIN INFORMATION, WALNUT RIVER, WHITEWATER RIVER, KANSAS.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W69-04534

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER AND CLEAR FORK, WILLIAMSBURG, KENTUCKY.
Corps of Engineers, Nashville, Tenn.
For primary bibliographic entry see Field 04A.
W69-04535

FLOOD PLAIN INFORMATION, HALLS MILL CREEK, MOBILE, ALABAMA.
Corps of Engineers, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W69-04536

FLOOD PLAIN INFORMATION, MERAMEC RIVER, BRUSH CREEK AND FOX CREEK, PACIFIC, MISSOURI.
Corps of Engineers, St. Louis, Mo.
For primary bibliographic entry see Field 04A.
W69-04537

FLOOD PLAIN INFORMATION, ROANOKE RIVER, AND ROANOKE AND SALEM, VIRGINIA.
Hayes, Seay, Mattern and Mattern, Roanoke, Va.
For primary bibliographic entry see Field 04A.
W69-04538

FLOOD PLAIN INFORMATION, BLACK RIVER, TOWN AND MANSKER CREEKS, POCAHONTAS, ARKANSAS.
Corps of Engineers, Little Rock, Ark.
For primary bibliographic entry see Field 04A.
W69-04539

FLOOD PLAIN INFORMATION, OHIO RIVER AND TRIBUTARIES, MC CRACKEN COUNTY, KENTUCKY.
Corps of Engineers, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W69-04540

FLOOD PLAIN INFORMATION, ARKANSAS RIVER, NORTH LITTLE ROCK, ARKANSAS.
Corps of Engineers, Little Rock, Ark.
For primary bibliographic entry see Field 04A.
W69-04541

FLOOD PLAIN INFORMATION ON CAMP CREEK AND NORTH FORK CAMP CREEK, METROPOLITAN ATLANTA, GEORGIA.
Corps of Engineers, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W69-04542

FLOOD PLAIN INFORMATION, MILL CREEK, FORT SMITH, ARKANSAS.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W69-04543

FLOOD PLAIN INFORMATION, BROOKLYN CREEK, ATHENS, GEORGIA.
Corps of Engineers, Savannah, Ga.
For primary bibliographic entry see Field 04A.
W69-04544

FLOOD PLAIN INFORMATION ON SHOAL CREEK, DEKALB COUNTY, GEORGIA.
Corps of Engineers, Savannah, Ga.
For primary bibliographic entry see Field 04A.
W69-04545

FLOOD PLAIN INFORMATION, PISCATAWAY CREEK, PRINCE GEORGES COUNTY, MARYLAND.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W69-04546

FLOOD PLAIN INFORMATION, POST OAK CREEK AND TRIBUTARIES, SHERMAN, TEXAS.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W69-04576

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02E.
W69-04616

6G. Ecologic Impact of Water Development

DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
G. J. Panlik.
In POLLUTION AND MARINE ECOLOGY, New York: Interscience Publishers, 1967, pp 67-85.

Descriptors: *Ecology, *Model studies, *Digital computers, *Simulation analysis, Computer models, Computers, Equipment, Instrumentation, Systems analysis.

The article describes the use of digital-computer simulation for ecological studies. The author believes that simulation techniques could be beneficially applied to ecological problems, but that they have not yet found such application except in selected instances. The author describes various models and their application as well as the differences between analytical solutions and simulation approaches. Simulation languages of potential use in modeling ecological systems are discussed.
W69-04312

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
Ruth Patrick.
Report of Committee on Public Works, U. S. Senate, Washington, D. C., April 17, 1968.

Descriptors: *Virginia, *Ecology, *Maryland, *Electric powerplants, Appalachian Mountain region, Atlantic coastal plain, Coastal plains, Geographical regions, Northeast U. S., Bays, Southeast U. S., Regions, Engineering structures, Industrial plants, Powerplants, Structures, Bodies of water.

Dr. Patrick's statement is a description of a program of studies carried out in the vicinity of electric generating plants in Chesapeake Bay to determine the condition of the estuaries (Monocacy and Patuxent rivers) before the plants began to operate, particularly in reference to ecological conditions. Fifteen pages of tables accompany the statement.
W69-04314

COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
Federal Water Pollution Control Administration, Southeast Region, Atlanta, Ga.
For primary bibliographic entry see Field 05C.
W69-04364

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
Robert Livingstone, Jr.
Report, U. S. Department of the Interior, Fish and Wildlife Service, Washington, D. C., May, 1965.

Descriptors: *Bibliographies, *Ecology, *Documentation, *Coasts, Environment, Southeast U. S., Northeast U. S.

This bibliography, which contains more than 5,470 references, is an initial effort to bring together references on the ecology of estuaries and coastal water of the eastern United States, and stresses the period 1900-60. It is the starting point for the compilation of a more comprehensive list of the future. The bibliography is in two parts: (1) the complete entries listed alphabetically by authors and (2) a KWIC index (keyword-in-context) to significant words relevant to title and context.
W69-04477

07. RESOURCES DATA

7A. Network Design

TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 02E.
W69-04571

7B. Data Acquisition

A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
Colorado State Univ., Fort Collins; and Forest Service, Washington, D. C.
G. J. Gottfried, and C. J. Campbell.
Forest Serv Res Note RM-120, 1968. 3 p, 2 fig, 1 tab, 1 ref.

Descriptors: *Instrumentation, *Temperature, *Thermometers, *Snowpacks, Snowmelt, Water supply, Snow cover, Snow management, Snow surveys, Water equivalent, Water yield.
Identifiers: Snowpack thermistor, Snowpack temperature, Shielded thermistor.

A phenol-resin-based shield has been designed to protect a thermistor probe that can be inserted into a snowpack. The shield also serves as an insulator between the thermistor and the aluminum pole used to push the probe assembly into the snowpack. With the probe and Wheatstone bridge circuit, temperatures can be measured within the snowpack to 0.1 deg C. (Knapp-USGS)
W69-04252

SEISMIC EXPLORATION AT SEA,
E. M. McNatt.
Ocean Industry, Vol. 2, No. 6, June, 1967, pp 30-33.

Descriptors: *Exploration, *Seismic studies, *Geophysics, Geologic formations, Remote sensing, Sounding, Sub-surface investigations, Analytical techniques, Costs.

Problems involved in seismographic exploration at sea include: too little depth penetration, too much noise, too little resolving power, and too high a cost. Present offshore seismic exploration survey costs per mile are roughly one-third of those on land.
W69-04294

REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
National Security Industrial Association, Washington, D. C.
For primary bibliographic entry see Field 05G.
W69-04343

A SUPPLEMENTARY REPORT ON THE COASTAL WETLANDS INVENTORY OF LONG ISLAND, NEW YORK.

Fish and Wildlife Service, Division of River Basin Studies, June, 1965.

Descriptors: *Wetlands, *Land reclamation, *Surveys, Recreation, Industries, Marinas, Recreation facilities, Waste disposal, Landfills, Forecasting.

Aerial photographs and ground observations were used to determine the physical loss of wetlands since the initial survey in 1954; 13 percent were lost in 1954-59, 18 percent were lost in 1959-64. Thirty-four percent of the destruction was due to housing development, 17 percent to recreational development, 13 percent to industry, six percent to marinas and channels, four percent to airports, three percent to roads, and one percent to waste disposal. Approximately 88 percent of the wetlands were considered vulnerable.
W69-04506

MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
Geological Survey, Washington, D. C.
George F. Smoot, and Charles E. Novak.
Geol Surv Tech Water-Resources Invest, Book 3, Chapter A11, 1969. 22 p, 12 fig, 1 tab, 4 ref.

Descriptors: *Discharge (Water), *Discharge measurement, Rivers, Estuaries, Streamflow, Stream gages, Calibrations, Boats, Current meters, Channel morphology, Sounding, Acoustics, Bathymetry, Fathometers, Surveys.
Identifiers: Stream gaging, Moving-boat streamflow measurement.

The procedures for measuring discharge in large streams by the moving-boat technique are

described. During the traverse of a boat across a stream, a sonic sounder records the geometry of the cross section, and a continuously operating current meter senses the combined stream and boat velocities. These data are converted to discharge for the cross section quickly, efficiently, and inexpensively. Measurements obtained by the moving-boat technique compare within 5% of measurements obtained by conventional means. Field and office procedures applicable to this method are outlined. Theory of technique is developed and equipment required is described. Selection and preparation of the cross section is detailed. A complete facsimile example of computation of a moving-boat measurement is given, and the determination and application of adjustment factors are described. (Knapp-USGS)
W69-04547

SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02E.
W69-04555

INFRARED IMAGING FOR WATER RESOURCES STUDIES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and HRB-Singer, Inc., State College, Pa.
James I. Taylor, and Ronald W. Stingelin.
ASCE Proc, J Hydraul Div, Vol 95, No HY1, Pap 6331, pp 175-189, Jan 1969. 15 p, 11 fig, 8 ref.

Descriptors: *Remote sensing, *Infrared radiation, Instrumentation, Thermal radiation, Aircraft, Electronic equipment, Photometry, Estuaries, Currents (Water), Path of pollutants, Tracking techniques, Streamflow, Water resources.
Identifiers: Infrared scanners, Infrared detection, Aerial infrared surveys.

With the easing of security restrictions, increasing attention has been given to the applicability of infrared remote sensing in water resources studies. Infrared scanning systems provide a pictorial display of the infrared energy emitted by terrain features. Geometric distortions are usually present in the imagery, but are of minor consequence in the interpretation. Recent applications include studies of the interaction of river and sea water and attendant current patterns in a tidal estuary, and current patterns and pollutions studies in the Great Lakes. The informational content of the infrared imagery can be improved for special purposes through various enhancement techniques, including variable detector-filter configurations, provision for manual gain control, signal differentiation, and development of a calibrated line-scan imaging system. (Knapp-USGS)
W69-04556

ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
California Univ., Berkeley. Dept. of Mineral Technology.
For primary bibliographic entry see Field 02F.
W69-04606

REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
Wyoming Univ., Laramie. Minuteman School of Civil Engineering.
For primary bibliographic entry see Field 02E.
W69-04607

7C. Evaluation, Processing and Publication

MARKOV CHAINS OF ORDER GREATER THAN ONE,
Oregon State Univ., Corvallis. Dept. of Statistics.
For primary bibliographic entry see Field 02B.
W69-04238

A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Research Council of Alberta, Edmonton.
Wm. R. Turner.
Ground Water, Vol 5, No 4, pp 30-37, Oct 1967. 8 p, 5 fig, 4 ref.

Descriptors: *Groundwater, *Data processing, *Data storage and retrieval, *Transmissivity, Computer models, Computer programs, Data collections, Analog computers, Hydrology, Environmental effects.
Identifiers: *Hydrodat computer-oriented system, *Aquifer transmissibility, Variable discharge.

The Hydrodat computer-oriented system developed for this purpose is a modification of the format developed by the U. S. Geological Survey and conforms to the proposed interagency compatibility requirements set forth by the Canada Department of Energy, Mines, and Resources. The basic elements of the systems are: a well-schedule form for the recording and coding of geologic, hydrologic, and water-quality data; and five 80-column IBM punch cards for transferring the coded data to magnetic tape. The article contains the following chapters: (1) introduction; (2) system development; (3) the Hydrodat System; (4) data processing; (5) master files; and (6) conclusions. Several examples of well-schedule forms are given in the article. (Gabriel-USGS)
W69-04624

08. ENGINEERING WORKS

8A. Structures

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
For primary bibliographic entry see Field 02L.
W69-04478

PORT INFORMATION SOURCES.

Report, Division of Ports and Systems, Office of Maritime Promotion, Maritime Administration, Washington, D. C., September, 1966.

Descriptors: *Harbors, *Administration, *Bibliographies, *Operations, *Design, *Construction, Data collections, Publications, Technical writing, Information retrieval, Design data, Fabrication.

A list of all publications and available information sources on port administration, port operation, port design, and port construction is presented.
W69-04491

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning; and Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W69-04551

8B. Hydraulics

TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 02E.
W69-04203

VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
University Coll. of Wales, Aberystwyth. Dept. of Physics.
For primary bibliographic entry see Field 02F.
W69-04243

STEAM-ELECTRIC PLANT CONSTRUCTION COST AND ANNUAL PRODUCTION EXPENSES--1965.

Federal Power Commission, 1966.

Descriptors: *Electric powerplants, *Steam turbins, *Cost analysis, *Construction costs, Powerplants, Thermal powerplants, Engineering structures, Industrial plants, Structures, Equipment, Turbines, Analysis, Mathematical studies, Electric power, Costs.

This report is primarily designed to provide data on steam-electric powerplant costs. It also provides a listing of the larger plants and their sources of condensing water. A complete listing of plants is available in the Federal Power Commission files.
W69-04503

8C. Hydraulic Machinery

THERMAL POLLUTION OF WATER.
For primary bibliographic entry see Field 05C.
W69-04349

CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
Report, Department of the Interior, Washington, D. C., July, 1965.

Descriptors: *Tidal energy, *Tidal powerplants, *Hydroelectric plants, *New England, *Project feasibility, Energy, Electric powerplants, Engineering structures, Industrial plants, Powerplants, Structures, Afterbays, Cost-benefit analysis, Geographical regions, Northeast U. S., Feasibility, Hydroelectric power, Electric power, Governments.

This report transmits to the President comments by various Federal and State groups and individuals concerning the report of the Passamaquoddy-Saint John River Study Committee. The latter report presents the findings of studies concerning the feasibility and desirability of the Passamaquoddy Tidal Power Project and the Upper Saint John River Hydroelectric Power Development.
W69-04459

SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02E.
W69-04555

THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
Societe Hispano-Suiza, Bois-Colombes (France).
For primary bibliographic entry see Field 03A.
W69-04595

8H. Rapid Excavation

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
Corps of Engineers, Philadelphia, Pa. Operations Div.
For primary bibliographic entry see Field 02L.
W69-04581

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
Chile Univ., Santiago.
Espildora C. Basilio.
For the 8 Volume Proceedings, see Vol 2, No 9, Field 06B and W69-03305. Int Conf on Water for Peace, Wash, D C, Vol 5, pp 787-794, 1968. 8 p, 2 tab, 5 ref.

Descriptors: *Training, *Universities, *Hydrology, Research facilities, Human resources, Mathematics.
Identifiers: *Chile, Chile University.

The present and future programs are outlined for training hydrologists in the School of Physical Sciences and Mathematics, University of Chile. Supplemental courses in fields related to hydrology are offered in other schools of the University. The human and material resources in hydrology of the school are indicated, and principal lines of research are outlined. (Vorhis-USGS)
W69-04611

9D. Grants, Contracts, and ResearchAct Allotments

WATER RESOURCES RESEARCH CATALOG.

Office of Water Resources Research, Department of the Interior, Washington, D. C., Vol 3, December 1967.

Descriptors: *Water resources development, *Bibliographies, *Research and development, *Federal government, Governments.

This publication is an annotated compilation of 4,193 federally-supported water resources research projects in progress as of December, 1966. W69-04360

10. SCIENTIFIC AND TECHNICAL INFORMATION

NATIONAL ESTUARINE INVENTORY: HANDBOOK OF DESCRIPTORS,
Federal Water Pollution Control Administration, Washington, D. C. Office of Estuarine Studies.
T. A. Wastler, and L. C. deGuerrero.
FWPCA Report, June, 1968.

Descriptors: *Documentation, *Information retrieval, *United States, *Estuarine environment, *Water pollution, Geographical regions, Regions, Aquatic environment, Environment.

The handbook is a skeleton for the recording of information. It consists of a set of tables for the organization of information and data. It is designed for the National Estuarine Pollution Study. The appendix contains a list of all estuaries in United States boundaries.
W69-04358

SUBJECT INDEX

ABANDONED FARMLAND
EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

ABANDONMENT
ABANDONMENT OF CANAL LANDS.
W69-04402 06E

ACCRETION(LEGAL ASPECTS)
PAXSON V COLLINS (TITLE TO ACCRETION AND RELICTION).
W69-04368 06E

HAMBURG REALTY COMPANY V WOODS (OWNERSHIP OF LAND FORMED IN RIVER).
W69-04375 06E

TOWN OF HEMPSTEAD, LIDO BEACH, NASSAU COUNTY (CONDEMNATION AWARDS).
W69-04669 06E

ADMINISTRATION
BEACH CONTROL RULES AND REGULATIONS.
W69-04409 06E

WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
W69-04457 05G

PORT INFORMATION SOURCES.
W69-04491 08A

MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
W69-04644 06E

ADMINISTRATIVE AGENCIES
WATERWORKS AND WATER SUPPLIES.
W69-04367 04A

WATER IMPROVEMENT COMMISSION.
W69-04377 05G

WATER QUALITY MANAGEMENT AND CONTROL.
W69-04404 05G

IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
W69-04416 03F

ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

COMMERCE AND NAVIGATION.
W69-04663 04A

WATER SUPPLY.
W69-04697 03D

STATE BEACH EROSION COMMISSION.
W69-04698 04D

ADMINISTRATIVE DECISIONS
LOA RIVER BASIN WATER RESOURCES AND THEIR DISTRIBUTION,
W69-04613 04A

ADMIRALTY
GEORGE V BEAVARK, INC (LAKE NAVIGABILITY FOR ADMIRALTY PURPOSES).
W69-04384 06E

ADSORPTION
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

AERIAL PHOTOGRAPHY
REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
W69-04343 05G

AESTHETICS
THE BUFFALO SCENIC RIVERWAY.
W69-04201 06B

THE PRINCIPLES OF WATERFRONT RENEWAL A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
W69-04476 06B

AGRICULTURAL WATERSHED
ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

AGRICULTURE
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

AIR POLLUTION
BIBLIOGRAPHY ON AIR AND WATER POLLUTION,
W69-04496 05G

ALABAMA
WATERWORKS AND WATER SUPPLIES.
W69-04367 04A

WATER IMPROVEMENT COMMISSION.
W69-04377 05G

GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
W69-04625 02F

ALKALINE WATER
SILICA IN ALKALINE BRINES,
W69-04270 02K

ALLUVIAL CHANNELS
RIVER METAMORPHOSIS,
W69-04583 02E

ALLUVIUM
REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
W69-04607 02E

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

ALTERATION OF FLOW
POIRE V SERRA (INJUNCTION PROHIBITING THE FILLING IN OF A RIVER).
W69-04376 06E

ALUMINUM
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

ANAEROBIC CONDITIONS
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

ANAEROBIC DIGESTION
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

ANALOG MODELS
DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

ANALYTICAL TECHNIQUES
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

ANEMOMETERS
SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

ANISOTROPY
FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
W69-04552 02F

ANNEXATION
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

APPROPRIATION
A K ROY, INC V BOARD OF COMM'RS (EXTENT OF LEVEE DISTRICT APPROPRIATION POWER).
W69-04689 04A

AQUATIC ANIMALS
COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

AQUATIC ENVIRONMENT
EFFECTS OF FERTILIZER ON FOOD CHAIN ORGANISMS AND FISH PRODUCTION IN NORRIS RESERVOIR, TENNESSEE.
W69-04202 02I

THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

AQUATIC HABITATS
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

AQUATIC LIFE
THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

AQUATIC PRODUCTIVITY
NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

AQUEOUS SOLUTIONS
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

AQUIFER CHARACTERISTICS

GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
W69-04625 02F

AQUIFER TRANSMISSIBILITY
TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

AQUIFERS
A NOTE ON THE GHYBEN-HERZBERG FORMULA,
W69-04569 02F

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

ARIZONA
WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

ARKANSAS
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

FARELLY LAKE LEVEE DISTRICT OF JEFFERSON AND ARKANSAS COUNTIES V HAMPTON (RATIFICATION OF CONTRACT TO REPAY CONTRIBUTIONS FROM LANDOWNERS).
W69-04369 06E

GEORGE V BEAVARK, INC (LAKE NAVIGABILITY FOR ADMIRALTY PURPOSES).
W69-04384 06E

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

JONES V OZ-ARK-VAL POULTRY CO (RIGHT TO THE USE OF SUBTERRANEAN WATERS).
W69-04690 06D

ARKANSAS RIVER
CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).
W69-04651 06E

ARTIFICIAL RECHARGE
COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
W69-04563 04B

ARTIFICIAL USE
HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).
W69-04429 04A

ARTIFICIAL WATERCOURSES
BEATTY V FLAIL (ARTIFICIAL CHANNEL OF SURFACE WATER WASHED ONTO ADJOINING LAND).
W69-04686 04A

ASSESSMENTS
A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

CITY OF TREASURE ISLAND V STRONG (ASSESSMENTS FOR EROSION CONTROL GROIN SYSTEM).
W69-04653 04D

ATLANTA
METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

ATLANTIC COASTAL PLAIN
STATEMENT,
W69-04306 05D

PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
W69-04355 06B

ATLANTIC OCEAN
STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
W69-04410 06E

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).
W69-04668 05G

BANK EROSION
SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
W69-04241 02L

BASS
CHESAPEAKE BAY WATER SUPPLY WEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

BAYS
THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
W69-04449 06B

AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

BEACH EROSION
LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
W69-04389 04D

WATER FRONT IMPROVEMENTS.
W69-04407 06E

HARBOR AND WATER FRONT COMMISSION BEACH EROSION CONTROL DISTRICT.
W69-04414 06E

CITY OF TREASURE ISLAND V STRONG (ASSESSMENTS FOR EROSION CONTROL GROIN SYSTEM).
W69-04653 04D

STATE BEACH EROSION COMMISSION.
W69-04698 04D

BEACH EROSION COMMISSION
STATE BEACH EROSION COMMISSION.
W69-04698 04D

BEACHES
OIL SPILLAGE STUDY LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
W69-04309 05G

PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
W69-04350 05G

BEACH CONTROL RULES AND REGULATIONS.
W69-04409 06E

BED LOAD
DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
W69-04554 02J

BEDS
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

BEDS UNDER WATER
STATE OF TEXAS V CHUOKE (OWNERSHIP OF SUBMERGED LANDS).
W69-04383 06E

BENEFICIAL USE
ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

BENEFITS
MAN AND THE ESTUARY.
W69-04283 06B

ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

THERMAL POLLUTION OF WATER,
W69-04385 05C

RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

THE CONTRIBUTION OF THE AMERICAN MERCHANT MARINE TO THE U. S. BALANCE OF PAYMENTS.
W69-04460 06C

COMPARISONS OF METHODS FOR RECREATION EVALUATION,
W69-04474 06B

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
W69-04482 06B

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

BIBLIOGRAPHIES
ESTUARIES,
W69-04278 02L

WATER RESOURCES RESEARCH CATALOG.
W69-04360 09D

EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
W69-04468 05G

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
W69-04477 06G

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
W69-04482 06B

PORT INFORMATION SOURCES.
W69-04491 08A

COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

BIBLIOGRAPHY ON AIR AND WATER POLLUTION,
W69-04496 05G

TOURISM AND RECREATION.
W69-04510 06B

EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

BENEFIT-COST ANALYSIS FOR WATER RESOURCES PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY.
W69-04629 06B

BIOCHEMICAL OXYGEN DEMAND
RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
W69-04456 05C

BIOLOGICAL TREATMENT
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

BOARD OF FISH AND GAME COMMISSIONERS
BOARD OF GAME AND FISH COMMISSIONERS POWERS AND DUTIES.
W69-04435 06E

BOARD OF PUBLIC WORKS
BOARD OF PUBLIC WORKS.
W69-04413 06E

BOARD OF TRUSTEES
GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

BOATING
STATEMENT,
W69-04303 06B

BOATS
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

BOREHOLE GEOPHYSICS
CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
W69-04601 02F

BOTTOM SEDIMENTS
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

BOUNDARIES(PROPERTY)
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

BURGESS V PINE ISLAND CORP (LAND SEPARATED FROM ISLAND BY NON-NAVIGABLE STREAM NOT AN ISLAND).
W69-04652 06E

BOUNDARY DISPUTES
INTERNAL IMPROVEMENT FUND OF STATE OF FLORIDA V NOWAK (USE OF MEANDER LINES IN SETTING BOUNDARIES OF RIPARIAN PROPERTY).
W69-04374 06E

BRACKISH WATER
ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

BRIDGE CONSTRUCTION
HUNTER V CITY OF SHREVEPORT (BRIDGE CONSTRUCTION).
W69-04667 06E

BRIDGES
BRIDGES OVER CERTAIN TIDAL WATERS CHANGING COURSE OF STREAM.
W69-04417 04A

BRIDGES TO CONFORM TO WHARF LINES.
W69-04423 04A

DEPARTMENT OF HIGHWAYS OF LOUISIANA V UNITED STATES (REVOCATION OF BRIDGE PERMIT).
W69-04670 06E

BRINES
LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

SILICA IN ALKALINE BRINES,
W69-04270 02K

BULK DENSITY
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

BULKHEADS
NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

CALIFORNIA
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

THE FUTURE OF AN ESTUARY,
W69-04290 05G

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

PLAN DEVELOPING FOR UNDERWATER PARKS.
W69-04317 06B

REMARKS BY BRIGADIER GENERAL JOHN A. B. DILLARD, DIVISION ENGINEER, SOUTH PACIFIC.
W69-04324 04A

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

THE CALIFORNIA OYSTER INDUSTRY,
W69-04442 06B

DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
W69-04472 06B

THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
W69-04483 03A

THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

CANAL CONSTRUCTION
CANAL COMPANIES - POWERS AND DUTIES.
W69-04405 04A

CANALS
ABANDONMENT OF CANAL LANDS.
W69-04402 06E

CANAL COMPANIES - POWERS AND DUTIES.
W69-04405 04A

CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

DISPOSITION OF CANALS AND CANAL PROPERTIES PROHIBITED.
W69-04656 04A

WILLFUL INJURIES TO THE CANALS AND DRAWING WATER FROM THE CANALS.
W69-04662 04A

CAPITAL COSTS
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

CARBONATE ROCKS
HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
W69-04267 03D

CHANNEL IMPROVEMENT
MARITIME AGENCY STATUS, CHANNEL PROBLEMS CREATED BY HUGE SHIPS CONCERNS OF AAPA.
W69-04287 04A

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
W69-04478 02L

CHANNEL MORPHOLOGY

RIVER METAMORPHOSIS,
W69-04583 02E

CHATTAHOOCHEE RIVER BASIN
METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

CHECK STRUCTURES
RIVER IMPROVEMENT.
W69-04401 04A

CHEMICAL PROPERTIES
IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

CHICAGO
FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

CHILE
THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

CHLORINE COMPOUNDS
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

CITIES
MUNICIPALITIES.
W69-04380 04D

NORTH JERSEY DIST WATER SUPPLY COMM'N V CITY OF NEWARK (RESCISSION OF WATER SUPPLY CONTRACTS).
W69-04408 06E

BEACH CONTROL RULES AND REGULATIONS.
W69-04409 06E

POWERS OF CITIES.
W69-04657 06E

WATER-WORKS.
W69-04693 04A

PUBLIC UTILITIES METHODS OF SUPPLYING WATER.
W69-04695 03D

PUBLIC UTILITIES MUNICIPALITY AND ITS EXCLUSIVE RIGHT TO SUPPLY WATER.
W69-04696 03D

CITY PLANNING
THE PRINCIPLES OF WATERFRONT RENEWAL A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
W69-04476 06B

CLASSIFICATION
GEOCHEMISTRY OF NATURAL WATERS,
W69-04562 02K

CLAYS
CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
W69-04261 02F

CLEAR-CUTTING
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

COASTS
STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
W69-04341 06E

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
W69-04477 06G

A NOTE ON THE GHYBEN-HERZBERG FORMULA,
W69-04569 02F

COLIFORMS
COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
W69-04344 05G

COLORADO RIVER BASIN
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

COLUMBIA RIVER
PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
W69-04478 02L

DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

WATER TEMPERATURES IN THE LOWER COLUMBIA RIVER,
W69-04605 02E

COMMERCIAL CRAFT
WATER FRONT IMPROVEMENTS.
W69-04692 04A

COMMERCIAL FISH
ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

COMMERCIAL FISHING
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

FISH PROTEIN CONCENTR)TE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
W69-04305 06B

THE SEAFOOD INDUSTRY, A LOCAL ANALYSIS.
W69-04337 06B

STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

COMMERCIAL SHELLFISH
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

THE SEAFOOD INDUSTRY, A LOCAL ANALYSIS.
W69-04337 06B

STATEMENT,
W69-04338 06B

TIME, MANNER AND PURPOSE OF TAKING SHELLFISH.
W69-04432 06E

ROUGH CULL LAW.
W69-04433 06E

THE CALIFORNIA OYSTER INDUSTRY,
W69-04442 06B

COMPETING USES
THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
W69-04307 06F

COMPETITION
RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

'NATURAL RESOURCES AND THE QUALITY OF LIFE',
W69-04440 06B

COMPUTER MODELS
MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

CONCRETES
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

CONDEMNATION
STATE OF TEXAS V CRUOKE (OWNERSHIP OF SUBMERGED LANDS).
W69-04383 06E

CANAL COMPANIES - POWERS AND DUTIES.
W69-04405 04A

PROTECTION OF ROADS NEAR TIDEWATER ACQUISITION OF LANDS.
W69-04419 06E

STERKX V GRAVITY DRAINAGE DISTRICT NO 1 OF RAPIDES PARISH (VALUE OF PROPERTY CONFISCATED FOR DRAINAGE PURPOSES).
W69-04650 04A

CONDEMNATION VALUE
TOWN OF HEMPSTEAD, LIDO BEACH, NASSAU COUNTY (CONDEMNATION AWARDS).
W69-04669 06E

CONNECTICUT

TOWN OF GREENWICH V GREENWICH WATER CO (PUBLIC UTILITY RIVER DIVERSION).
W69-04688 06D

CONSERVATION
THE PUBLIC INTEREST IN PRESERVING NATURAL AREAS,
W69-04475 06D

CONSTRUCTION
WATERSIDE SITE PLANT LOCATIONS AND EXPANSIONS 1966.
W69-04361 04A

PORT INFORMATION SOURCES.
W69-04491 08A

CONSTRUCTION COSTS
PUBLIC WORK NEEDS - MARINE PORT FACILITIES.
W69-04495 06B

STEAM-ELECTRIC PLANT CONSTRUCTION COST AND ANNUAL PRODUCTION EXPENSES--1965.
W69-04503 08B

CONTINENTAL SHELF
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
W69-04505 06B

CONTINENTAL SLOPE
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

CONTRACTS
FARELLY LAKE LEVEE DISTRICT OF JEFFERSON AND ARKANSAS COUNTIES V HAMPTON (RATIFICATION OF CONTRACT TO REPAY CONTRIBUTIONS FROM LANDOWNERS).
W69-04369 06E

SEABOARD AIR LINE RAILROAD CO V SARASOTA-FRUITVILLE DRAINAGE DISTRICT (DRAINAGE WATER DAMAGES).
W69-04682 04A

CONVECTION
CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
W69-04601 02F

CONVENTION HALL PIER
CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

COOLING
THERMAL POLLUTION HOT ISSUE FOR INDUSTRY,
W69-04325 05C

THERMAL POLLUTION OF WATER.
W69-04349 05C

COOLING TOWER
'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

COOLING TOWERS
STATEMENT.
W69-04342 05G

WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

A COOLING POND PROVES CHEAPER,
W69-04447 05C

COOLING WATER
1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

CORPS OF ENGINEERS
WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

COST ANALYSIS
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

TECHNOLOGY ADDING BILLIONS TO RESERVES.
W69-04348 06B

NUTRIENTS,
W69-04448 05C

COMPARISONS OF METHODS FOR RECREATION EVALUATION,
W69-04474 06B

STEAM-ELECTRIC PLANT CONSTRUCTION COST AND ANNUAL PRODUCTION EXPENSES--1965.
W69-04503 08B

COST COMPARISONS
A COOLING POND PROVES CHEAPER,
W69-04447 05C

FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

COST SHARING
A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

COSTS
MAN AND THE ESTUARY.
W69-04283 06B

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
W69-04319 05G

ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

SALINE WATER CONVERSION REPORT.
W69-04498 03A

WATER DESALINATION PROPOSALS FOR A COSTING PROCEDURE AND RELATED TECHNICAL AND ECONOMIC CONSIDERATIONS.
W69-04513 03A

COST-BENEFIT ANALYSIS
RECREATION,
W69-04458 06B

BENEFIT-COST ANALYSIS ITS RELEVANCE TO PUBLIC INVESTMENT DECISIONS,
W69-04479 06B

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
W69-04482 06B

COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

THE POLITICAL ECONOMY OF EFFICIENCY COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
W69-04519 06B

BENEFIT-COST ANALYSIS FOR WATER RESOURCES PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY.
W69-04629 06B

COST-BENEFIT RATIO
A CALL FOR ACTION,
W69-04352 06B

ON THE USES AND ABUSES OF ECONOMIC SCIENCE IN EVALUATING PUBLIC OUTDOOR RECREATION,
W69-04500 06B

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
W69-04502 05G

COUNTY ORDINANCES
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

CULLING
ROUGH CULL LAW.
W69-04433 06E

CULTIVATION
LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

CULTURAL CONTROL
ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
W69-04339 06B

CULVERTS
FRYE V PENNSYLVANIA RAILROAD CO (RAILROAD'S LIABILITY FOR NEGLIGENTLY MAINTAINING CULVERT THROUGH RIGHT-OF-WAY).
W69-04683 06E

CURRENTS(WATER)
CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
W69-04559 02L

CYCLING NUTRIENTS
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

DAM CONSTRUCTION
THE ZUYDERZEE WORKS.
W69-04365 04A

PUBLIC UTILITIES - CONSTRUCTION AND OPERATION OF DAMS.
W69-04406 04A

TOWN OF GREENWICH V GREENWICH WATER CO (PUBLIC UTILITY RIVER DIVERSION).
W69-04688 06D

DAMAGES
STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).
W69-04372 05B

DAVIES V SHAFFER (OBSTRUCTION OF DRAINAGE DITCHES).
W69-04684 04A

SMITH V WAGNER (ARTIFICIAL CONCENTRATION OF DRAINAGE ON NEIGHBOR'S LAND).
W69-04685 04A

DAMS
HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

PUBLIC UTILITIES - CONSTRUCTION AND OPERATION OF DAMS.
W69-04406 04A

AGRICULTURAL DEVELOPMENT AND EXPANSION IN THE NILE BASIN PROGRAMS, PRODUCTION AND IMPLICATIONS FOR U. S. AGRICULTURE,
W69-04641 03F

LITTLE V UNITED STATES (WRONGFUL DEATH LIABILITY FOR DAM MAINTENANCE).
W69-04666 06E

DATA COLLECTIONS
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

PORTS OF THE WORLD, 1967.
W69-04320 06C

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

COMPILATION OF HYDROLOGIC DATA, WALLER AND WILBARGER CREEKS, COLORADO RIVER BASIN, TEXAS-1966.
W69-04599 02E

DATA PROCESSING
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

DATA STORAGE AND RETRIEVAL
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

DECIDUOUS FORESTS
A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

DEEP TUNNEL PLAN
FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

DELAWARE
RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

DELAWARE RIVER
ISLANDS IN DELAWARE RIVER.
W69-04430 06E

DELAWARE RIVER MODEL STUDY REPORT NO. 2 - SALINITY TESTS OF EXISTING CHANNEL.
W69-04466 02L

ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
W69-04489 05G

DELAWARE RIVER.
W69-04699 06E

DELAWARE RIVER BASIN COMMISSION
INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
W69-04427 03D

DEMANDS
WHEN DOES A FISHERY BECOME UNECONOMIC,
W69-04485 06B

DEPTH
UNITED STATES V REPUBLIC STEEL CORP (INJUNCTION TO FORCE COMPANY TO RESTORE RIVER TO ORIGINAL DEPTH).
W69-04671 06E

DEPTH-AREA-DURATION ANALYSIS
GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

DESALINATION
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
W69-04305 06B

ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
W69-04463 03A

SALINE WATER CONVERSION REPORT.
W69-04498 03A

WATER DESALINATION PROPOSALS FOR A COSTING PROCEDURE AND RELATED TECHNICAL AND ECONOMIC CONSIDERATIONS.
W69-04513 03A

THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

DESALINATION PLANTS
THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
W69-04483 03A

DESIGN
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

PORT INFORMATION SOURCES.
W69-04491 08A

DESIGN CRITERIA
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

DIAGENESIS
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

DIFFUSION
CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
W69-04261 02F

DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

DIFFUSIVITY
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

DIGITAL COMPUTERS
DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
W69-04312 06G

DIKES
LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

DISASTERS
MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES.
W69-04285 05G

OIL SPILLAGE STUDY LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
W69-04309 05G

SPILL POLLUTION - ITS EFFECTS AND CONTROL,
W69-04322 05G

PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
W69-04350 05G

DISCHARGE
THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.
W69-04391 05B

DISCHARGE MEASUREMENT
1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
W69-04547 07B

DISCHARGE(WATER)
MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
W69-04547 07B

BEATTY V FLAIL (ARTIFICIAL CHANNEL OF SURFACE WATER WASHED ONTO ADJOINING LAND).
W69-04686 04A

DISSOLVED OXYGEN
A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,

W69-04439 05B

ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
W69-04456 05C

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

DISSOLVED SOLIDS
THE FUTURE OF AN ESTUARY,
W69-04290 05G

DISTRICT OF COLUMBIA
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

DITCHES
DAVIES V SHAFFER (OBSTRUCTION OF DRAINAGE DITCHES).
W69-04684 04A

DIURNAL DISTRIBUTION
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

DIVERSION
TIDEWATER NAVIGATION.
W69-04398 04A

BRIDGES OVER CERTAIN TIDAL WATERS CHANGING COURSE OF STREAM.
W69-04417 04A

A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

DIVERSION STRUCTURES
SMITH V WAGNER (ARTIFICIAL CONCENTRATION OF DRAINAGE ON NEIGHBOR'S LAND).
W69-04685 04A

DOCKS
WHARVES AND FISH WEIRS.
W69-04379 04A

WATER FRONT IMPROVEMENTS.
W69-04692 04A

DOCUMENTATION
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
W69-04477 06G

DRAINAGE
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

POWERS OF CITIES.
W69-04657 06E

BILL OF RIGHTS.
W69-04658 04A

DRAINAGE DISTRICTS
SEABOARD AIR LINE RAILROAD CO V SARASOTA-FRUITVILLE DRAINAGE DISTRICT (DRAINAGE WATER DAMAGES).
W69-04682 04A

DRAINAGE PROGRAMS
CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

DRAINAGE SYSTEMS
STORMWATER SEWERS FOR COUNTY ROADS MUNICIPAL COOPERATION.
W69-04418 04C

STERKX V GRAVITY DRAINAGE DISTRICT NO 7 OF RAPIDES PARISH (VALUE OF PROPERTY CONFISCATED FOR DRAINAGE PURPOSES).
W69-04650 04A

KERHONKSON LODGE INC V STATE OF NEW YORK (ACTION FOR DAMAGE FROM SURFACE WATER DISCHARGE).
W69-04673 04C

RANDALL V CLIFFORD (POLLUTION AND DESTRUCTION OF WATER SUPPLY).
W69-04678 05G

DRAINAGE WATER
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

SMITH V WAGNER (ARTIFICIAL CONCENTRATION OF DRAINAGE ON NEIGHBOR'S LAND).
W69-04685 04A

DRAINS
HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).
W69-04429 04A

DRAWDOWN
PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
W69-04573 02F

DREDGING
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

1967 PROCEEDINGS OF WODCON.
W69-04321 04A

TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

UNITED STATES V REPUBLIC STEEL CORP (INJUNCTION TO FORCE COMPANY TO RESTORE RIVER TO ORIGINAL DEPTH).
W69-04671 06E

CAMPBELL BROWN CO, INC V ELKINS (RIVERBED OWNERSHIP).
W69-04691 06E

DRILLING
PROBLEMS OF A DRILLING CONTRACTOR,
W69-04275 06C

WORLD OFFSHORE RIG FLEET TO BALLOON AGAIN IN 1968,
W69-04328 06B

DRYING
THE DRYING THROUGH THE TOP SURFACE OF A VERTICAL POROUS COLUMN,
W69-04602 02G

DURATION CURVES
GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

DYE RELEASES
DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

EASEMENTS
EQUITABLE GAS CO V ROCCA (RIGHTS OF LANDOWNER TO CONSTRUCT A RESERVOIR OVER AN EASEMENT ON THAT LAND).
W69-04700 06E

ECOLOGY
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

STATEMENT,
W69-04306 05D

POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
W69-04312 06G

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
W69-04314 06G

COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
W69-04477 06G

THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

ECONOMIC EFFICIENCY
MAN AND THE ESTUARY.
W69-04283 06B

ECONOMIC FEASIBILITY
ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
W69-04463 03A

THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
W69-04483 03A

ECONOMIC IMPACT
MEASURING THE IMPACT OF THE WATERBORNE COMMERCE OF THE PORTS OF VIRGINIA ON EMPLOYMENT, WAGES, AND OTHER KEY INDICES OF THE VIRGINIA ECONOMY, 1953-1965.

W69-04295 06B

REMARKS BY BRIGADIER GENERAL JOHN A. B. DILLARD, DIVISION ENGINEER, SOUTH PACIFIC.
W69-04324 04A

ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

STATEMENT,
W69-04338 06B

THE CONTRIBUTION OF THE AMERICAN MERCHANT MARINE TO THE U. S. BALANCE OF PAYMENTS.
W69-04460 06C

A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
W69-04505 06B

THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

ECONOMIC PREDICTION
OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
W69-04305 06B

SUMMARY ECONOMIC BASE STUDY CHESAPEAKE BAY DRAINAGE BASINS.
W69-04346 06B

ECOSYSTEMS
THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
W69-04307 06F

ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
W69-04524 02K

EEL RIVER
SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

EFFLUENT
A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

ELECTRIC POWER
'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

ELECTRIC POWER INDUSTRY
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

ELECTRIC POWERPLANTS
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
W69-04314 06G

REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
W69-04327 05G

STEAM-ELECTRIC PLANT CONSTRUCTION COST AND ANNUAL PRODUCTION EXPENSES--1965.
W69-04503 08B

ELECTRICAL STUDIES
ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

EMERGENCY WATER SUPPLY
STATE SANITARY CODE.
W69-04395 05G

EMINENT DOMAIN
FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.
W69-04403 04A

STERKX V GRAVITY DRAINAGE DISTRICT NO 1 OF RAPIDES PARISH (VALUE OF PROPERTY CONFISCATED FOR DRAINAGE PURPOSES).
W69-04650 04A

BILL OF RIGHTS.
W69-04658 04A

ENCROACHMENT
SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

ENERGY TRANSFER
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

ENFORCEMENT
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

ENVIRONMENTAL EFFECTS
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
W69-04347 04A

A CALL FOR ACTION,
W69-04352 06B

NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

ENVIRONMENTAL SANITATION
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

DRINKING WATER SUPPLIES.
W69-04394 05F

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.
W69-04396 05G

EROSION
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

RIVER METAMORPHOSIS,
W69-04583 02E

EROSION CONTROL
WATER FRONT IMPROVEMENTS.
W69-04407 06E

PROTECTION OF ROADS NEAR TIDEWATER ACQUISITION OF LANDS.
W69-04419 06E

CITY OF TREASURE ISLAND V STRONG (ASSESSMENTS FOR EROSION CONTROL GROIN SYSTEM).
W69-04653 04D

ESTIMATED COSTS
WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
W69-04359 05G

PUBLIC WORK NEEDS - MARINE PORT FACILITIES.
W69-04495 06B

WATER POLLUTION CONTROL FACTS.
W69-04515 05G

FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

ESTIMATING
RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
W69-04615 02F

ESTUARIES
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
W69-04244 02L

FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
W69-04472 06B

SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
W69-04559 02L

USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
W69-04580 02L

ESTUARINE ENVIRONMENT
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

A CALL FOR ACTION,
W69-04352 06B

STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
W69-04486 05C

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,

W69-04512 06F

ESTUARINE ENVIRONMENTS
VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

ESTUARINE FISHERIES
ESTUARIES,
W69-04278 02L

ESTUARINE NEKTON,
W69-04292 02L

STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

EUTROPHICATION
WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
W69-04223 05B

NUTRIENTS,
W69-04448 05C

EVALUATION
WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

EVAPORATION
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
W69-04242 02G

VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

EVAPORIMETERS
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

EXPENDITURES
RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

WHEN DOES A FISHERY BECOME UNECONOMIC,
W69-04485 06B

EXPERIMENTAL WATERSHEDS
A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

WATERSHED CALIBRATION METHODS,
W69-04634 03B

EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

EXPLORATION
SEISMIC EXPLORATION AT SEA,
W69-04294 07B

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

FACILITIES
PORTS OF THE WORLD, 1967.
W69-04320 06C

FEDERAL BUDGETS
A TEN-YEAR PROGRAM OF FEDERAL WATER RESOURCES RESEARCH.
W69-04473 06B

FEDERAL GOVERNMENT
MARINE SCIENCE AFFAIRS...A YEAR OF TRANSITION.
W69-04286 06E

A REPORT ON POLLUTION OF THE NATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES.
W69-04326 05G

WASTE FROM WATERCRAFT.
W69-04357 05G

WATER RESOURCES RESEARCH CATALOG.
W69-04360 09D

POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

SALINE WATER CONVERSION REPORT.
W69-04498 03A

A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
W69-04505 06B

1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

LITTLE V UNITED STATES (WRONGFUL DEATH LIABILITY FOR DAM MAINTENANCE).
W69-04666 06E

DEPARTMENT OF HIGHWAYS OF LOUISIANA V UNITED STATES (REVOCATION OF BRIDGE PERMIT).
W69-04670 06E

FEDERAL JURISDICTION
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

FEDERAL TORT CLAIMS ACT
HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

FEDERAL-STATE WATER RIGHTS CONFLICTS
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

FILTERS
COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
W69-04563 04B

CONDITIONS FOR BETTER FILTERED WATER,
W69-04591 05D

FILTRATION
CONDITIONS FOR BETTER FILTERED WATER,
W69-04591 05D

FINANCIAL FEASIBILITY
THE POLITICAL ECONOMY OF EFFICIENCY COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
W69-04519 06B

FINANCING
ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.
W69-04411 06E

WATER FRONT IMPROVEMENTS.
W69-04692 04A

FISH
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

FISH CONSERVATION
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

ATLANTIC STATES MARINE FISHERIES COMMISSION.
W69-04426 06E

FISH FARMING
ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
W69-04339 06B

FISH HANDLING FACILITIES
FISH PROTEIN CONCENTRATE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

STATEMENT,
W69-04338 06B

FISH HARVEST
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

ESTUARINE NEKTON,
W69-04292 02L

FISH MANAGEMENT
ATLANTIC STATES MARINE FISHERIES COMMISSION.
W69-04426 06E

WHEN DOES A FISHERY BECOME UNECONOMIC,
W69-04485 06B

FISH POPULATIONS
AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

FISH STOCKING
BOARD OF GAME AND FISH COMMISSIONERS POWERS AND DUTIES.

W69-04435 06E

FISHERIES
THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

FLASH DISTILLATION
THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

FLOATING
LITTERING AND OBSTRUCTIONS,
W69-04450 06E

FLOOD CONTROL
RIVER IMPROVEMENT.
W69-04401 04A

FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.
W69-04403 04A

USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
W69-04596 04A

FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

KEY SALES CO V SOUTH CAROLINA ELECTRIC AND GAS CO (DAM OPERATOR'S DUTY OF CARE IN REGARD TO FLOODING OF DOWNSTREAM PROPERTY).
W69-04665 04A

FLOOD DAMAGE
FLOOD PLAIN INFORMATION, CALCASIEU RIVER, OAKDALE, LOUISIANA.
W69-04215 04A

FLOOD PLAIN INFORMATION, KERN RIVER, KERNVILLE, CALIFORNIA.
W69-04216 04A

FLOOD PLAIN INFORMATION, LAS CHOLLAS CREEK, SAN DIEGO COUNTY, CALIFORNIA.
W69-04217 04A

FLOOD PLAIN INFORMATION, FEATHER AND YUBA RIVERS, MARYSVILLE YUBA CITY, CALIFORNIA.
W69-04218 04A

FLOOD PLAIN INFORMATION, PAYETTE RIVER, PAYETTE, IDAHO AND VICINITY.
W69-04219 04A

FLOOD PLAIN INFORMATION, SANTA CLARA RIVER (SATICOY TO PACIFIC OCEAN), VENTURA COUNTY, CALIFORNIA.
W69-04220 04A

FLOOD PLAIN INFORMATION, JOHNSON CREEK, ARLINGTON AND GRAND PRAIRIE, TEXAS.
W69-04221 04A

GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

FLOOD PLAIN INFORMATION, RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN.
W69-04529 04A

FLOOD PLAIN INFORMATION, SWAPPINGER CREEK, DEKALB COUNTY, GEORGIA.
W69-04530 04A

FLOOD PLAIN INFORMATION, CLEARWATER RIVER, OROFINO AND RIVERSIDE, IDAHO.
W69-04531 04A

FLOOD PLAIN INFORMATION, MILL RIVER, HAMDEN, CONNECTICUT.
W69-04532 04A

FLOOD PLAIN INFORMATION, TULE RIVER, SPRINGVILLE, CALIFORNIA.
W69-04533 04A

FLOOD PLAIN INFORMATION, WALNUT RIVER, WHITEWATER RIVER, KANSAS.
W69-04534 04A

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER AND CLEAR FORK, WILLIAMSBURG, KENTUCKY.
W69-04535 04A

FLOOD PLAIN INFORMATION, HALLS MILL CREEK, MOBILE, ALABAMA.
W69-04536 04A

FLOOD PLAIN INFORMATION, MERAMEC RIVER, BRUSH CREEK AND FOX CREEK, PACIFIC, MISSOURI.
W69-04537 04A

FLOOD PLAIN INFORMATION, ROANOKE RIVER, AND ROANOKE AND SALEM, VIRGINIA.
W69-04538 04A

FLOOD PLAIN INFORMATION, BLACK RIVER, TOWN AND HANSKER CREEKS, POCAHONTAS, ARKANSAS.
W69-04539 04A

FLOOD PLAIN INFORMATION, OHIO RIVER AND TRIBUTARIES, MC CRACKEN COUNTY, KENTUCKY.
W69-04540 04A

FLOOD PLAIN INFORMATION, ARKANSAS RIVER, NORTH LITTLE ROCK, ARKANSAS.
W69-04541 04A

FLOOD PLAIN INFORMATION ON CAMP CREEK AND NORTH FORK CAMP CREEK, METROPOLITAN ATLANTA, GEORGIA.
W69-04542 04A

FLOOD PLAIN INFORMATION, MILL CREEK, FORT SMITH, ARKANSAS.
W69-04543 04A

FLOOD PLAIN INFORMATION, BROOKLYN CREEK, ATHENS, GEORGIA.
W69-04544 04A

FLOOD PLAIN INFORMATION ON SHOAL CREEK, DEKALB COUNTY, GEORGIA.
W69-04545 04A

FLOOD PLAIN INFORMATION, PISCATAWAY CREEK, PRINCE GEORGES COUNTY, MARYLAND.
W69-04546 04A

FLOOD PLAIN INFORMATION, POST OAK CREEK AND TRIBUTARIES, SHERMAN, TEXAS.
W69-04576 04A

FLOOD FORECASTING
PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
W69-04582 02E

FLOOD PLAINS
FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
W69-04249 04A

FLOOD PROTECTION
CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

FLOODS
FLOOD PLAIN INFORMATION, CALCASIEU RIVER, OAKDALE, LOUISIANA.
W69-04215 04A

FLOOD PLAIN INFORMATION, KERN RIVER, KERNVILLE, CALIFORNIA.
W69-04216 04A

FLOOD PLAIN INFORMATION, LAS CHOLLAS CREEK, SAN DIEGO COUNTY, CALIFORNIA.
W69-04217 04A

FLOOD PLAIN INFORMATION, FEATHER AND YUBA RIVERS, MARYSVILLE YUBA CITY, CALIFORNIA.
W69-04218 04A

FLOOD PLAIN INFORMATION, PAYETTE RIVER, PAYETTE, IDAHO AND VICINITY.
W69-04219 04A

FLOOD PLAIN INFORMATION, SANTA CLARA RIVER (SATICOY TO PACIFIC OCEAN), VENTURA COUNTY, CALIFORNIA.
W69-04220 04A

FLOOD PLAIN INFORMATION, JOHNSON CREEK, ARLINGTON AND GRAND PRAIRIE, TEXAS.
W69-04221 04A

CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
W69-04249 04A

FLOOD PLAIN INFORMATION, RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN.
W69-04529 04A

FLOOD PLAIN INFORMATION, SWAPPINGER CREEK, DEKALB COUNTY, GEORGIA.
W69-04530 04A

FLOOD PLAIN INFORMATION, CLEARWATER RIVER, OROFINO AND RIVERSIDE, IDAHO.
W69-04531 04A

FLOOD PLAIN INFORMATION, MILL RIVER, HAMDEN, CONNECTICUT.
W69-04532 04A

FLOOD PLAIN INFORMATION, TULE RIVER, SPRINGVILLE, CALIFORNIA.
W69-04533 04A

FLOOD PLAIN INFORMATION, WALNUT RIVER, WHITEWATER RIVER, KANSAS.
W69-04534 04A

FLOOD PLAIN INFORMATION, CUMBERLAND RIVER AND CLEAR FORK, WILLIAMSBURG, KENTUCKY.
W69-04535 04A

FLOOD PLAIN INFORMATION, HALLS MILL CREEK, MOBILE, ALABAMA.
W69-04536 04A

FLOOD PLAIN INFORMATION, MERAMEC RIVER, BRUSH CREEK AND FOX CREEK, PACIFIC, MISSOURI.
W69-04537 04A

FLOOD PLAIN INFORMATION, ROANOKE RIVER, AND ROANOKE AND SALEM, VIRGINIA.

W69-04538 04A

FLOOD PLAIN INFORMATION, BLACK RIVER, TOWN AND MANSKER CREEKS, POCAHONTAS, ARKANSAS.
W69-04539 04A

FLOOD PLAIN INFORMATION, OHIO RIVER AND TRIBUTARIES, MC CRACKEN COUNTY, KENTUCKY.
W69-04540 04A

FLOOD PLAIN INFORMATION, ARKANSAS RIVER, NORTH LITTLE ROCK, ARKANSAS.
W69-04541 04A

FLOOD PLAIN INFORMATION ON CAMP CREEK AND NORTH FORK CAMP CREEK, METROPOLITAN ATLANTA, GEORGIA.
W69-04542 04A

FLOOD PLAIN INFORMATION, MILL CREEK, FORT SMITH, ARKANSAS.
W69-04543 04A

FLOOD PLAIN INFORMATION, BROOKLYN CREEK, ATHENS, GEORGIA.
W69-04544 04A

FLOOD PLAIN INFORMATION ON SHOAL CREEK, DEKALB COUNTY, GEORGIA.
W69-04545 04A

FLOOD PLAIN INFORMATION, PISCATAWAY CREEK, PRINCE GEORGES COUNTY, MARYLAND.
W69-04546 04A

FLOOD PLAIN INFORMATION, POST OAK CREEK AND TRIBUTARIES, SHERMAN, TEXAS.
W69-04576 04A

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
W69-04616 02E

FLORIDA
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

PAXSON V COLLINS (TITLE TO ACCRETION AND RELICTION).
W69-04368 06E

INTERNAL IMPROVEMENT FUND OF STATE OF FLORIDA V NOWAK (USE OF MEANDER LINES IN SETTING BOUNDARIES OF RIPARIAN PROPERTY).
W69-04374 06E

ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

BURGESS V PINE ISLAND CORP (LAND SEPARATED FROM ISLAND BY NON-NAVIGABLE STREAM NOT AN ISLAND).
W69-04652 06E

CITY OF TREASURE ISLAND V STRONG (ASSESSMENTS FOR EROSION CONTROL GROIN SYSTEM).
W69-04653 04D

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).
W69-04668 05G

SEABOARD AIR LINE RAILROAD CO V SARASOTA-FRUITVILLE DRAINAGE DISTRICT (DRAINAGE WATER DAMAGES).
W69-04682 04A

FLOW
VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
W69-04552 02F

THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

FLOW AUGMENTATION
'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

FLOW CHARACTERISTICS
VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

FLOW CONTROL
ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
W69-04648 06E

FLOW MEASUREMENT
TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO,
W69-04598 02E

FLOW SEPARATION
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

FLUID FRICTION
VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

FOODS
FISH PROTEIN CONCENTRATE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

FORECASTING
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
W69-04362 06B

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

FOREIGN COUNTRIES
ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

THE ZUYDERZEE WORKS.
W69-04365 04A

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

FOREIGN WATERS
ESTUARIES,
W69-04278 02L

THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
W69-04445 05C

FOREST MANAGEMENT
OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

FOREST SOILS
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

FRANCE
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

A RIVER HARNESSED THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
W69-04594 04A

FREE ENERGY
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

FRENCH WEST AFRICA
ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

FRESH WATER
EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
W69-04521 05C

FROST
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

FROZEN GROUND
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

FURBEARERS
THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

FUTURE PLANNING(PROJECTED)
WEST COAST OIL FUTURE IS BRIGHT.
W69-04363 06B

A TEN-YEAR PROGRAM OF FEDERAL WATER RESOURCES RESEARCH.
W69-04473 06B

GAS CHROMATOGRAPHY
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

GATES
HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

OWNERS OF MARSH AND MEADOW LANDS.
W69-04431 06E

GEOCHEMISTRY
GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

GEOCHEMISTRY OF NATURAL WATERS,
W69-04562 02K

ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

GEOHYDROLOGIC UNITS
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

GEOLOGIC INVESTIGATION
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

GEOMORPHOLOGY
GEOMORPHIC GROUPING OF SOILS IN WATERSHED ENGINEERING,
W69-04207 02E

TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

GEOPHYSICAL STUDIES
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

GEOPHYSICS
SEISMIC EXPLORATION AT SEA,
W69-04294 07B

ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

GEORGIA
WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

STATEMENT,
W69-04306 05D

MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
W69-04334 02L

STATEMENT,
W69-04338 06B

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
W69-04353 05G

STATEMENT,
W69-04354 05G

METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

GEOTHERMAL STUDIES
TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

GLACIAL DRIFT
TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

GLACIERS
GLACIERS AND WATER SUPPLY,
W69-04255 02C

GOVERNMENTS
A MODEL LAND DEVELOPMENT CODE.
W69-04301 06E

STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
W69-04341 06E

PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
W69-04355 06B

GRAVELS
TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

GREAT LAKES
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

GREAT LAKES REGION
STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
W69-04341 06E

GREAT PLAINS
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

GROUNDWATER
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
W69-04231 04B

ILLINOIS GROUND WATER POLLUTION,
W69-04256 05B

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
W69-04268 02F

EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
W69-04564 02F

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

GROUND-WATER OVERDRAFT
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
W69-04206 02F

GROUND-WATER RECHARGE
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
W69-04206 02F

GROUND-WATER SAFE YIELD
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
W69-04206 02F

GROWTH RATES
EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
W69-04486 05C

GULF COASTAL PLAIN
GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

GULF OF MEXICO
IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

HABITAT IMPROVEMENT
VANISHING TIDELANDS,
W69-04323 06E

HABITATS
PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
W69-04362 06B

NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

HARBORS
MARITIME AGENCY STATUS, CHANNEL PROBLEMS CREATED BY HUGE SHIPS CONCERNS OF AAPA.
W69-04287 04A

MEASURING THE IMPACT OF THE WATERBORNE COMMERCE OF THE PORTS OF VIRGINIA ON EMPLOYMENT, WAGES, AND OTHER KEY INDICES OF THE VIRGINIA ECONOMY, 1953-1965.
W69-04295 06B

PORTS OF THE WORLD, 1967.
W69-04320 06C

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

HARBOR AND WATER FRONT COMMISSION BEACH EROSION CONTROL DISTRICT.
W69-04414 06E

THE PRINCIPLES OF WATERFRONT RENEWAL A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
W69-04476 06B

PORT INFORMATION SOURCES.
W69-04491 08A

PUBLIC WORK NEEDS - MARINE PORT FACILITIES.
W69-04495 06B

THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

HEAT BALANCE
HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

HEAT TRANSFER
HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

HEATED WATER
COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

HERBICIDES
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

HIGHWAYS
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

HISTORIC FLOOD
CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

HISTORY
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
W69-04449 06B

COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

HOUSEBOATS
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

HUDSON RIVER
THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES.
W69-04490 05G

HUMAN RESOURCES
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

HYDRAULIC CONDUCTIVITY
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
W69-04604 02G

SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

HYDRAULIC MODELS
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
W69-04580 02L

HYDRODAT COMPUTER-ORIENTED SYSTEM
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

HYDRODYNAMICS
HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

HYDROELECTRIC PLANTS
COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
W69-04459 08C

HYDROELECTRIC POWER
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

HYDROGEN ION CONCENTRATION
A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

HYDROGEOLOGY
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
W69-04625 02F

HYDROGRAPH ANALYSIS
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

HYDROGRAPHS
EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

HYDROLOGIC ANALYSIS
WATERSHED CALIBRATION METHODS,
W69-04634 03B

HYDROLOGIC ASPECTS
HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
W69-04548 04C

TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

HYDROLOGIC BUDGET
HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

HYDROLOGIC PROPERTIES
SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

HYDROLOGY
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

HYETOGRAPHS
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

ILLINOIS
FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,

W69-04249 04A

ILLINOIS GROUND WATER POLLUTION,
W69-04256 05B

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
W69-04382 05G

INCOME
RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

INDIANS
CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).
W69-04651 06E

INDUSTRIAL EFFLUENTS
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

INDUSTRIAL PLANTS
WATERSIDE SITE PLANT LOCATIONS AND EXPANSIONS 1966.
W69-04361 04A

OPERATING COSTS OF WASTE TREATMENT IN GENERAL MOTORS,
W69-04451 05D

INDUSTRIAL WASTEWATER CONTROL,
W69-04471 05D

INDUSTRIAL POLLUTION
A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

INDUSTRIAL WASTES
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
W69-04248 05C

RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).
W69-04372 05B

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
W69-04382 05G

INDUSTRIAL WASTEWATER CONTROL,
W69-04471 05D

1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

UNITED STATES V REPUBLIC STEEL CORP (INJUNCTION TO FORCE COMPANY TO RESTORE RIVER TO ORIGINAL DEPTH).
W69-04671 06E

INDUSTRIAL WATER
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

INDUSTRIAL WATER UTILIZATION
WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

INDUSTRIES
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

INFILTRATION
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

INFORMATION RETRIEVAL
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

INFRARED RADIATION
INFRARED IMAGING FOR WATER RESOURCES STUDIES,
W69-04556 07B

INJECTION WELLS
SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,
W69-04228 05E

INSECT CONTROL
MOSQUITO EXTERMINATION.
W69-04421 06E

INSECTICIDES
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

INSPECTION
DECLARATION AND ABATEMENT OF NUISANCES.
W69-04425 05G

INSTRUMENTATION
A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

INTAKES
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

INTERNATIONAL JOINT COMMISSION
ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
W69-04648 06E

INTERSTATE COMMISSIONS
ATLANTIC STATES MARINE FISHERIES COMMISSION.
W69-04426 06E

INTERSTATE COMPACTS
ATLANTIC STATES MARINE FISHERIES COMMISSION.
W69-04426 06E

DELAWARE RIVER.
W69-04699 06E

INTERTIDAL AREAS
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

INVESTMENT
BENEFIT-COST ANALYSIS ITS RELEVANCE TO PUBLIC INVESTMENT DECISIONS,
W69-04479 06B

WATER DESALINATION PROPOSALS FOR A COSTING PROCEDURE AND RELATED TECHNICAL AND ECONOMIC CONSIDERATIONS.
W69-04513 03A

ION EXCHANGE
EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

ION TRANSPORT
CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
W69-04261 02F

MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

IONS
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

IRON
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

IRRIGATION
YOUNG V CITY OF ASHEVILLE (RIPARIAN RIGHTS).
W69-04378 06E

IRRIGATION SYSTEMS
IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
W69-04416 03F

ISLANDS
LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
W69-04389 04D

ISLANDS IN DELAWARE RIVER.
W69-04430 06E

BURGESS V PINE ISLAND CORP (LAND SEPARATED FROM ISLAND BY NON-NAVIGABLE STREAM NOT AN ISLAND).
W69-04652 06E

WAGNER V CITY OF BALTIMORE (NAVIGABLE RIVER BEDS).
W69-04679 06E

JAMAICA
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA.
W69-04600 02F

JETTIES
MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
W69-04478 02L

JUDICIAL DECISIONS
FARELLY LAKE LEVEE DISTRICT OF JEFFERSON AND ARKANSAS COUNTIES V HAMPTON (RATIFICATION OF CONTRACT TO REPAY CONTRIBUTIONS FROM LANDOWNERS).
W69-04369 06E

HAMBURG REALTY COMPANY V WOODS (OWNERSHIP OF LAND FORMED IN

RIVER).
W69-04375 06E

STATE OF TEXAS V CHUOKE (OWNERSHIP OF SUBMERGED LANDS).
W69-04383 06E

GEORGE V BEAVARK, INC (LAKE NAVIGABILITY FOR ADMIRALTY PURPOSES).
W69-04384 06E

NORTH JERSEY DIST WATER SUPPLY COMM'N V CITY OF NEWARK (RESCISSION OF WATER SUPPLY CONTRACTS).
W69-04408 06E

DEPARTMENT OF HEALTH V PASSAIC VALLEY SEWERAGE COMMISSION (DEPARTMENT OF HEALTH'S AUTHORITY OF DISCHARGE OF SEWERAGE).
W69-04664 05G

BEATTY V FLAIL (ARTIFICIAL CHANNEL OF SURFACE WATER WASHED ONTO ADJOINING LAND).
W69-04686 04A

KARST
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

LAKE BEDS
A K ROY, INC V BOARD OF COMM'RS (EXTENT OF LEVEE DISTRICT APPROPRIATION POWER).
W69-04689 04A

LAKE MENDOTA(WIS)
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

LAKE METABOLISM
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

LAKE ONTARIO
WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
W69-04223 05B

ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
W69-04648 06E

LAKE STAGES
GEOLOGY OF GLACIAL LAKE AGASSIZ,
W69-04617 02H

LAKE TYPOLOGY
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

LAKES
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

LAND DEVELOPMENT
A MODEL LAND DEVELOPMENT CODE.
W69-04301 06E

LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

CAPITAL V PORT WASHINGTON YACHT CLUB (ACTION FOR LATERAL SUPPORT OF LAND, WITH ADDITIONAL CLAIMS FOR SURFACE WATER DAMAGE).
W69-04672 06E

LAND MANAGEMENT
THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
W69-04347 04A

LAND RECLAMATION
THE ZUYDERZEE WORKS.
W69-04365 04A

A SUPPLEMENTARY REPORT ON THE COASTAL WETLANDS INVENTORY OF LONG ISLAND, NEW YORK.
W69-04506 07B

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
W69-04512 06F

LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

LAND SUBSIDENCE
FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).
W69-04371 04C

LAND USE
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
W69-04616 02E

BLUE V CHARLES F HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).
W69-04654 05B

LANDFILLS
HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
W69-04267 03D

PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
W69-04347 04A

HEALTH AND VITAL STATISTICS COUNTY BOARD OF HEALTH.
W69-04420 05G

LEACHING
EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

LEGAL ASPECTS
NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
W69-04644 06E

LEGISLATION
MARINE SCIENCE AFFAIRS...A YEAR OF TRANSITION.
W69-04286 06E

A MODEL LAND DEVELOPMENT CODE.
W69-04301 06E

VANISHING TIDELANDS,
W69-04323 06E

A REPORT ON POLLUTION OF THE NATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES.
W69-04326 05G

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

RULES ON VESSEL POLLUTION PROPOSED BY SENATOR MUSKIE.
W69-04332 05G

A CALL FOR ACTION,
W69-04352 06B

STATEMENT,
W69-04354 05G

WASTE FROM WATERCRAFT.
W69-04357 05G

WHARVES AND FISH WEIRS.
W69-04379 04A

MUNICIPALITIES.
W69-04380 04D

STATE LAND NEEDED BY U S.
W69-04385 06E

COUNTY ZONING.
W69-04386 06E

ABANDONMENT OF CANAL LANDS.
W69-04402 06E

WATER FRONT IMPROVEMENTS.
W69-04407 06E

HARBOR AND WATER FRONT COMMISSION BEACH EROSION CONTROL DISTRICT.
W69-04414 06E

COUNTY SEWERAGE AUTHORITIES.
W69-04415 05G

HEALTH AND VITAL STATISTICS COUNTY BOARD OF HEALTH.
W69-04420 05G

ISLANDS IN DELAWARE RIVER.
W69-04430 06E

OWNERS OF MARSH AND MEADOW LANDS.
W69-04431 06E

TIME, MANNER AND PURPOSE OF TAKING SHELLFISH.
W69-04432 06E

ROUGH CULL LAW.

W69-04433 06E

GENERAL POWERS AND DUTIES.
W69-04434 06E

LITTERING AND OBSTRUCTIONS,
W69-04450 06E

POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
W69-04512 06F

NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
W69-04644 06E

DISPOSITION OF CANALS AND CANAL PROPERTIES PROHIBITED.
W69-04656 04A

INTERFERING WITH NAVIGATION.
W69-04661 06E

WILLFUL INJURIES TO THE CANALS AND DRAWING WATER FROM THE CANALS.
W69-04662 04A

COMMERCE AND NAVIGATION.
W69-04663 04A

WATER-WORKS.
W69-04693 04A

PUBLIC UTILITIES METHODS OF SUPPLYING WATER.
W69-04695 03D

PUBLIC UTILITIES MUNICIPALITY AND ITS EXCLUSIVE RIGHT TO SUPPLY WATER.
W69-04696 03D

WATER SUPPLY.
W69-04697 03D

STATE BEACH EROSION COMMISSION.
W69-04698 04D

DELAWARE RIVER.
W69-04699 06E

LEVEES
FARELLY LAKE LEVEE DISTRICT OF JEFFERSON AND ARKANSAS COUNTIES V HAMPTON (RATIFICATION OF CONTRACT TO REPAY CONTRIBUTIONS FROM LANDOWNERS).
W69-04369 06E

LINDANE
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

LINSLEY POND(CONN)
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

LITTORAL
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

LOCAL GOVERNMENTS
COUNTY ZONING.
W69-04386 06E

LOGGING(FOREST)
EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
W69-04632 04C

LONG-TERM PLANNING
FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
W69-04646 06B

LOUISIANA
CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

STERKX V GRAVITY DRAINAGE DISTRICT NO 1 OF RAPIDES PARISH (VALUE OF PROPERTY CONFISCATED FOR DRAINAGE PURPOSES).
W69-04650 04A

LITTLE V UNITED STATES (WRONGFUL DEATH LIABILITY FOR DAM MAINTENANCE).
W69-04666 06E

HUNTER V CITY OF SHREVEPORT (BRIDGE CONSTRUCTION).
W69-04667 06E

A K ROY, INC V BOARD OF COMM'RS (EXTENT OF LEVEE DISTRICT APPROPRIATION POWER).
W69-04689 04A

LYSIMETERS
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

MAINE
WHARVES AND FISH WEIRS.
W69-04379 04A

MUNICIPALITIES.
W69-04380 04D

SOIL AND WATER CONSERVATION DISTRICTS.
W69-04381 06E

THE PUBLIC INTEREST IN PRESERVING NATURAL AREAS,
W69-04475 06D

MANPOWER
SEAFARING EMPLOYMENT.
W69-04336 06B

MARINE ANIMALS
THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
W69-04445 05C

THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

MARINE FISHERIES
POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

MARINE MICROORGANISMS
NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
W69-04276 05C

MARKET VALUE
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

ESTUARINE NEKTON,
W69-04292 02L

MARKOV PROCESSES
MARKOV CHAINS OF ORDER GREATER THAN ONE,
W69-04238 02B

MARSHES
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

MARYLAND
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
W69-04314 06G

FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).
W69-04371 04C

CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
W69-04449 06B

LITTERING AND OBSTRUCTIONS,
W69-04450 06E

RECREATION,
W69-04458 06B

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

WAGNER V CITY OF BALTIMORE (NAVIGABLE RIVER BEDS).
W69-04679 06E

BATTISTO V PERKINS (ACTION FOR DAMAGE FROM INCREASED SURFACE WATER FLOW).
W69-04680 04C

MATHEMATICAL MODELS
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

THE FUTURE OF AN ESTUARY,
W69-04290 05G

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
W69-04489 05G

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
W69-04502 05G

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
W69-04568 02E

MATHEMATICAL STUDIES
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

THE MIXING PROCESSES IN A TIDAL ESTUARY,
W69-04444 02L

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

MEANDERS
INTERNAL IMPROVEMENT FUND OF STATE OF FLORIDA V NOWAK (USE OF MEANDER LINES IN SETTING BOUNDARIES OF RIPARIAN PROPERTY).
W69-04374 06E

MELTING
GLACIERS AND WATER SUPPLY,
W69-04255 02C

METEOROLOGY
ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
W69-04246 02A

HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

MIAMI RIVER VALLEY(OHIO)
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
W69-04206 02F

MICHIGAN
STATE LAND NEEDED BY U S.
W69-04385 06E

COUNTY ZONING.
W69-04386 06E

ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

WATER-WORKS.
W69-04693 04A

MIGRATION
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

MINE WASTES
POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
W69-04272 05E

MINIMUM FLOW
INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
W69-04427 03D

MINING
1967 PROCEEDINGS OF WODCON.
W69-04321 04A

MISSISSIPPI
STATEMENT.
W69-04342 05G

BLUE V CHARLES F HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).
W69-04654 05B

MISSISSIPPI RIVER
CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

MISSOURI
HAMBURG REALTY COMPANY V WOODS (OWNERSHIP OF LAND FORMED IN RIVER).
W69-04375 06E

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

MISSOURI RIVER
RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

MISSOURI RIVER ALLUVIUM
RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

MIXING
THE MIXING PROCESSES IN A TIDAL ESTUARY,
W69-04444 02L

MODEL STUDIES
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
W69-04312 06G

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

DELAWARE RIVER MODEL STUDY REPORT NO. 2 - SALINITY TESTS OF EXISTING CHANNEL.
W69-04466 02L

DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

MODEL STUDY
A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

MOISTURE TENSION
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

MONTANA
CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

MOSQUITO CONTROL
MOSQUITO EXTERMINATION.
W69-04421 06E

MOSQUITOES
MOSQUITO EXTERMINATION.
W69-04421 06E

NUISANCES AFFECTING HEALTH.
W69-04424 05G

MULTIPLE PURPOSE
THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
W69-04307 06F

MULTIPLE-PURPOSE PROJECTS
THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
W69-04463 03A

ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

A RIVER HARNESSED THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
W69-04594 04A

USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
W69-04596 04A

MUNICIPAL WASTES
ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,

W69-04248 05C

SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
W69-04366 05B

WATER POLLUTION CONTROL FACTS.
W69-04515 05G

MUNICIPAL WATER
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

NATIONAL PARKS
BENEATH THE SURFACE,
W69-04497 06B

NATURAL FLOW
BATTISTO V PERKINS (ACTION FOR DAMAGE FROM INCREASED SURFACE WATER FLOW).
W69-04680 04C

NATURAL FLOW DOCTRINE
HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
W69-04373 04A

LAWRENCE V BEHNCKE (INTERFERENCE WITH NATURAL WATER COURSE).
W69-04674 04A

NATURAL RESOURCES
'NATURAL RESOURCES AND THE QUALITY OF LIFE'
W69-04440 06B

THE PUBLIC INTEREST IN PRESERVING NATURAL AREAS,
W69-04475 06D

NAVIGABLE RIVERS
CAMPBELL BROWN CO, INC V ELKINS (RIVERBED OWNERSHIP).
W69-04691 06E

NAVIGABLE WATERS
WASTE FROM WATERCRAFT.
W69-04357 05G

STATE LAND NEEDED BY U S.
W69-04385 06E

NAVIGABLE WATERS OF THE STATE.
W69-04397 04A

RIVERS AND STREAMS AS PUBLIC HIGHWAYS.
W69-04399 06E

BRIDGES OVER CERTAIN TIDAL WATERS CHANGING COURSE OF STREAM.
W69-04417 04A

INTERFERING WITH NAVIGATION.
W69-04661 06E

DEPARTMENT OF HIGHWAYS OF LOUISIANA V UNITED STATES (REVOCATION OF BRIDGE PERMIT).
W69-04670 06E

WATER FRONT IMPROVEMENTS.
W69-04692 04A

NAVIGATION
MUNICIPALITIES.
W69-04380 04D

NAVIGABLE WATERS OF THE STATE.
W69-04397 04A

TIDEWATER NAVIGATION.
W69-04398 04A

RIVERS AND STREAMS AS PUBLIC HIGHWAYS.
W69-04399 06E

BRIDGES TO CONFORM TO WHARF LINES.
W69-04423 04A

ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

POWERS OF CITIES.
W69-04657 06E

PUBLIC NUISANCE DEFINED.
W69-04660 06E

INTERFERING WITH NAVIGATION.
W69-04661 06E

WILLFUL INJURIES TO THE CANALS AND DRAWING WATER FROM THE CANALS.
W69-04662 04A

COMMERCE AND NAVIGATION.
W69-04663 04A

NEGLIGENCE
HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

NEKTON
ESTUARIES,
W69-04278 02L

ESTUARINE NEKTON,
W69-04292 02L

NETWORKS
TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

NEW ENGLAND
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
W69-04459 08C

NEW HAMPSHIRE
SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
W69-04366 05B

POIRE V SERRA (INJUNCTION PROHIBITING THE FILLING IN OF A RIVER).
W69-04376 06E

NEW JERSEY
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

CANAL COMPANIES - POWERS AND DUTIES.
W69-04405 04A

PUBLIC UTILITIES - CONSTRUCTION AND OPERATION OF DAMS.
W69-04406 04A

WATER FRONT IMPROVEMENTS.
W69-04407 06E

NORTH JERSEY DIST WATER SUPPLY COMM'N V CITY OF NEWARK (RESCISSION OF WATER SUPPLY CONTRACTS).
W69-04408 06E

BEACH CONTROL RULES AND REGULATIONS.
W69-04409 06E

LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
W69-04410 06E

ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.
W69-04411 06E

CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

BOARD OF PUBLIC WORKS.
W69-04413 06E

HARBOR AND WATER FRONT COMMISSION BEACH EROSION CONTROL DISTRICT.
W69-04414 06E

COUNTY SEWERAGE AUTHORITIES.
W69-04415 05G

IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
W69-04416 03F

BRIDGES OVER CERTAIN TIDAL WATERS CHANGING COURSE OF STREAM.
W69-04417 04A

STORMWATER SEWERS FOR COUNTY ROADS MUNICIPAL COOPERATION.
W69-04418 04C

PROTECTION OF ROADS NEAR TIDEWATER ACQUISITION OF LANDS.
W69-04419 06E

HEALTH AND VITAL STATISTICS COUNTY BOARD OF HEALTH.
W69-04420 05G

MOSQUITO EXTERMINATION.
W69-04421 06E

PUBLIC SWIMMING POOLS AND PLACES.
W69-04422 06E

BRIDGES TO CONFORM TO WHARF LINES.
W69-04423 04A

NUISANCES AFFECTING HEALTH.
W69-04424 05G

DECLARATION AND ABATEMENT OF NUISANCES.
W69-04425 05G

INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
W69-04427 03D

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.
W69-04428 05G

ISLANDS IN DELAWARE RIVER.
W69-04430 06E

OWNERS OF MARSH AND MEADOW LANDS.

W69-04431 06E

TIME, MANNER AND PURPOSE OF TAKING SHELLFISH.
W69-04432 06E

ROUGH CULL LAW.
W69-04433 06E

GENERAL POWERS AND DUTIES.
W69-04434 06E

BOARD OF GAME AND FISH COMMISSIONERS POWERS AND DUTIES.
W69-04435 06E

COMMERCE AND NAVIGATION.
W69-04663 04A

DEPARTMENT OF HEALTH V PASSAIC VALLEY SEWERAGE COMMISSION (DEPARTMENT OF HEALTH'S AUTHORITY OF DISCHARGE OF SEWERAGE).
W69-04664 05G

BOROUGH OF WESTVILLE V WHITNEY HOME BUILDERS (SEWAGE EFFLUENTS FLOWING INTO CITY RECREATION AREA LAKE).
W69-04677 05G

PUBLIC UTILITIES METHODS OF SUPPLYING WATER.
W69-04695 03D

PUBLIC UTILITIES MUNICIPALITY AND ITS EXCLUSIVE RIGHT TO SUPPLY WATER.
W69-04696 03D

WATER SUPPLY.
W69-04697 03D

STATE BEACH EROSION COMMISSION.
W69-04698 04D

DELAWARE RIVER.
W69-04699 06E

NEW MEXICO
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

NEW YORK
WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
W69-04223 05B

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
W69-04389 04D

SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.
W69-04390 05G

THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.
W69-04391 05B

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
W69-04392 05G

GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

DRINKING WATER SUPPLIES.
W69-04394 05F

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.
W69-04396 05G

NAVIGABLE WATERS OF THE STATE.
W69-04397 04A

TIDEWATER NAVIGATION.
W69-04398 04A

RIVERS AND STREAMS AS PUBLIC HIGHWAYS.
W69-04399 06E

CONSERVATION LAW.
W69-04400 05G

RIVER IMPROVEMENT.
W69-04401 04A

ABANDONMENT OF CANAL LANDS.
W69-04402 06E

FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.
W69-04403 04A

WATER QUALITY MANAGEMENT AND CONTROL.
W69-04404 05G

FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
W69-04646 06B

WATER DISTRICTS.
W69-04655 04A

DISPOSITION OF CANALS AND CANAL PROPERTIES PROHIBITED.
W69-04656 04A

POWERS OF CITIES.
W69-04657 06E

BILL OF RIGHTS.
W69-04658 04A

THROWING GAS TAR OR REFUSE INTO PUBLIC WATERS AND WILLFULLY POISONING FOOD.
W69-04659 05G

PUBLIC NUISANCE DEFINED.
W69-04660 06E

INTERFERING WITH NAVIGATION.
W69-04661 06E

WILLFUL INJURIES TO THE CANALS AND DRAWING WATER FROM THE CANALS.
W69-04662 04A

TOWN OF HEMPSTEAD, LIDO BEACH, NASSAU COUNTY (CONDEMNATION AWARDS).
W69-04669 06E

CAPITAL V PORT WASHINGTON YACHT CLUB (ACTION FOR LATERAL SUPPORT OF LAND, WITH ADDITIONAL CLAIMS FOR SURFACE WATER DAMAGE).
W69-04672 06E

KERHONKSON LODGE INC V STATE OF NEW YORK (ACTION FOR DAMAGE FROM SURFACE WATER DISCHARGE).
W69-04673 04C

LAWRENCE V BEHNCKE (INTERFERENCE WITH NATURAL WATER COURSE).
W69-04674 04A

MALONE V CUSTOM MANOR (PRIVATE WATER LINES).
W69-04675 06E

GELLIS V TOWN OF HARRISON (INCREASED SURFACE RUNOFF).
W69-04676 04C

DECLARATION OF POLICY.
W69-04694 06E

NEW YORK STATE BARGE
DISPOSITION OF CANALS AND CANAL PROPERTIES PROHIBITED.
W69-04656 04A

NEW YORK STATE BARGE CANAL
ABANDONMENT OF CANAL LANDS.
W69-04402 06E

NILE BASIN
AGRICULTURAL DEVELOPMENT AND EXPANSION IN THE NILE BASIN PROGRAMS, PRODUCTION AND IMPLICATIONS FOR U. S. AGRICULTURE,
W69-04641 03F

NITRIFICATION
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

NITROGEN
THE FUTURE OF AN ESTUARY,
W69-04290 05G

NUTRIENTS,
W69-04448 05C

NITROGEN COMPOUNDS
EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
W69-04521 05C

NITROGEN UTILIZATION
EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
W69-04521 05C

NON-NAVIGABLE WATERS
GEORGE V BEAVARK, INC (LAKE NAVIGABILITY FOR ADMIRALTY PURPOSES).
W69-04384 06E

BURGESS V PINE ISLAND CORP (LAND SEPARATED FROM ISLAND BY NON-NAVIGABLE STREAM NOT AN ISLAND).
W69-04652 06E

NORTH CAROLINA
YOUNG V CITY OF ASHEVILLE (RIPARIAN RIGHTS).
W69-04378 06E

DEPARTMENT OF WATER AND AIR RESOURCES ORGANIZATION AND POWERS GENERALLY CONTROL OF POLLUTION.
W69-04687 05G

NUCLEAR POWERPLANTS
THERMAL POLLUTION HOT ISSUE FOR INDUSTRY,
W69-04325 05C

THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
W69-04463 03A

THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
W69-04483 03A

NUTRIENTS
NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
W69-04276 05C

NUTRIENTS,
W69-04448 05C

OBSTRUCTION TO FLOW
HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
W69-04373 04A

CAPITAL V PORT WASHINGTON YACHT CLUB (ACTION FOR LATERAL SUPPORT OF LAND, WITH ADDITIONAL CLAIMS FOR SURFACE WATER DAMAGE).
W69-04672 06E

LAWRENCE V BEHNCKE (INTERFERENCE WITH NATURAL WATER COURSE).
W69-04674 04A

FRYE V PENNSYLVANIA RAILROAD CO (RAILROAD'S LIABILITY FOR NEGLIGENTLY MAINTAINING CULVERT THROUGH RIGHT-OF-WAY).
W69-04683 06E

DAVIES V SHAFFER (OBSTRUCTION OF DRAINAGE DITCHES).
W69-04684 04A

OBSTRUCTION TO NAVIGATION
RIVERS AND STREAMS AS PUBLIC HIGHWAYS.
W69-04399 06E

OWNERS OF MARSH AND MEADOW LANDS.
W69-04431 06E

OCEAN CURRENTS
DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

OCEAN WAVES
SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
W69-04241 02L

OCEANOGRAPHY
OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
W69-04305 06B

POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

OFFSHORE PLATFORMS
PROBLEMS OF A DRILLING CONTRACTOR,
W69-04275 06C

WORLD OFFSHORE RIG FLEET TO BALLOON AGAIN IN 1968,
W69-04328 06B

OIL FIELDS
WEST COAST OIL FUTURE IS BRIGHT.
W69-04363 06B

OIL INDUSTRY
OCEANOGRAPHY--THE EMERGING SCIENCE OF THE SEA.
W69-04305 06B

OIL SPILL RELIEF SEEN SOON.
W69-04308 05B

POLICING THE OIL INDUSTRY.
W69-04318 05B

WORLD OFFSHORE RIG FLEET TO BALLOON AGAIN IN 1968,
W69-04328 06B

WHAT'S AHEAD IN OIL RECOVERY,
W69-04335 05G

TECHNOLOGY ADDING BILLIONS TO RESERVES.
W69-04348 06B

WEST COAST OIL FUTURE IS BRIGHT.
W69-04363 06B

OIL RESERVOIRS
WHAT'S AHEAD IN OIL RECOVERY,
W69-04335 05G

OIL WASTES
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

OIL SPILL RELIEF SEEN SOON.
W69-04308 05B

BLUE V CHARLES F HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).
W69-04654 05B

OIL WELLS
PROBLEMS OF A DRILLING CONTRACTOR,
W69-04275 06C

OILY WATER
OIL SPILLAGE STUDY LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
W69-04309 05G

PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
W69-04350 05G

OKLAHOMA
CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).
W69-04651 06E

OPEN CHANNEL FLOW
SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

OPERATING COSTS
PROBLEMS OF A DRILLING CONTRACTOR,
W69-04275 06C

FISH PROTEIN CONCENTR)TE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

OPERATING COSTS OF WASTE TREATMENT IN GENERAL MOTORS,
W69-04451 05D

DEEDS AND DATA.
W69-04465 05D

WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

OPERATIONS
PORT INFORMATION SOURCES.
W69-04491 08A

OPTIMUM DEVELOPMENT PLANS
A RIVER HARNESSED THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
W69-04594 04A

OREGON
PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
W69-04478 02L

ORGANIC WASTES
PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

ORGANIZATIONS
ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

ORGANOCHLORINES
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

ORGANOPHOSPHORUS COMPOUNDS
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

OUTLET WORKS
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

OWNERSHIP OF BEDS
STATE OF TEXAS V CHUOKE (OWNERSHIP OF SUBMERGED LANDS).
W69-04383 06E

CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).
W69-04651 06E

WAGNER V CITY OF BALTIMORE (NAVIGABLE RIVER BEDS).
W69-04679 06E

A K ROY, INC V BOARD OF COMM'RS (EXTENT OF LEVEE DISTRICT APPROPRIATION POWER).
W69-04689 04A

CAMPBELL BROWN CO, INC V ELKINS (RIVERBED OWNERSHIP).
W69-04691 06E

OXIDATION-REDUCTION POTENTIAL
A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

OXYGEN
SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,
W69-04439 05B

OYSTERS
VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
W69-04339 06B

ROUGH CULL LAW.
W69-04433 06E

THE CALIFORNIA OYSTER INDUSTRY,
W69-04442 06B

CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

OZONE
OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
W69-04230 05D

PACIFIC COAST REGION
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,

W69-04313 05E

PALEOHYDROLOGY
GEOLOGY OF GLACIAL LAKE AGASSIZ,
W69-04617 02H

PALEOLIMNOLOGY
LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

PAPADOPULOS-COOPER METHOD
PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
W69-04573 02F

PARASITISM
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

PARKS
PLAN DEVELOPING FOR UNDERWATER PARKS.
W69-04317 06B

CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

PATENTS
WAGNER V CITY OF BALTIMORE (NAVIGABLE RIVER BEDS).
W69-04679 06E

PATH OF POLLUTANTS
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
W69-04559 02L

PAVING
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

PEAT
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

PENNSYLVANIA
HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
W69-04373 04A

BURR V ADAM EIDEMILLER, INC (SUBSURFACE POLLUTION OF WATER SUPPLY).
W69-04681 05G

FRYE V PENNSYLVANIA RAILROAD CO (RAILROAD'S LIABILITY FOR NEGLIGENTLY MAINTAINING CULVERT THROUGH RIGHT-OF-WAY).
W69-04683 06E

DAVIES V SHAFFER (OBSTRUCTION OF DRAINAGE DITCHES).
W69-04684 04A

SMITH V WAGNER (ARTIFICIAL CONCENTRATION OF DRAINAGE ON NEIGHBOR'S LAND).
W69-04685 04A

BEATTY V FLAIL (ARTIFICIAL CHANNEL OF SURFACE WATER WASHED ONTO ADJOINING LAND).
W69-04686 04A

PERCOLATING WATER
FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).
W69-04371 04C

JONES V OZ-ARK-VAL POULTRY CO (RIGHT TO THE USE OF SUBTERRANEAN WATERS).
W69-04690 06D

PERIODIC OBSERVATIONS
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

PERMEABILITY
THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

PERMITS
DECLARATION AND ABATEMENT OF NUISANCES.
W69-04425 05G

NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

DEPARTMENT OF HIGHWAYS OF LOUISIANA V UNITED STATES (REVOCATION OF BRIDGE PERMIT).
W69-04670 06E

DEPARTMENT OF WATER AND AIR RESOURCES ORGANIZATION AND POWERS GENERALLY CONTROL OF POLLUTION.
W69-04687 05G

WATER FRONT IMPROVEMENTS.
W69-04692 04A

PESTICIDES
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

PHOSPHORUS
NUTRIENTS,
W69-04448 05C

PHOSPHORUS COMPOUNDS
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

PHYSICAL PROPERTIES
TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

PIERS
MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

PIPE FLOW
JONES V OZ-ARK-VAL POULTRY CO (RIGHT TO THE USE OF SUBTERRANEAN WATERS).
W69-04690 06D

PIPES
GELLIS V TOWN OF HARRISON (INCREASED SURFACE RUNOFF).
W69-04676 04C

PIT RECHARGE
COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
W69-04563 04B

PLANNING
ECONOMIC AND ENGINEERING ASPECTS OF WATER IN DELAWARE'S AGRI BUSINESS INDUSTRY,
W69-04204 03F

A MODEL LAND DEVELOPMENT CODE.
W69-04301 06E

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

A CALL FOR ACTION,
W69-04352 06B

CONSERVATION LAW.
W69-04400 05G

PUBLIC WORK NEEDS - MARINE PORT FACILITIES.
W69-04495 06B

METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

POISONS
THROWING GAS TAR OR REFUSE INTO PUBLIC WATERS AND WILLFULLY POISONING FOOD.
W69-04659 05G

POLITICAL ASPECTS
POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

THE POLITICAL ECONOMY OF EFFICIENCY COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
W69-04519 06B

POLLUTANT IDENTIFICATION
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

POLLUTANTS
NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
W69-04276 05C

POLLUTION
SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.
W69-04390 05G

THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.
W69-04391 05B

NAVIGABLE WATERS OF THE STATE.
W69-04397 04A

HUNTER V CITY OF SHREVEPORT (BRIDGE CONSTRUCTION).
W69-04667 06E

POLLUTION ABATEMENT
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

PONDS
A COOLING POND PROVES CHEAPER,
W69-04447 05C

POROUS MEDIA
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
W69-04242 02G

VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
W69-04552 02F

THE DRYING THROUGH THE TOP SURFACE OF A VERTICAL POROUS COLUMN,
W69-04602 02G

POTHOLES
GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

POWERPLANTS
STATEMENT.
W69-04342 05G

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
W69-04486 05C

PRAIRIE POTHOLES
GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

PRECIPITABLE WATER
WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
W69-04239 02B

PRECIPITATION
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

PRECIPITATION EXCESS
BATTISTO V PERKINS (ACTION FOR DAMAGE FROM INCREASED SURFACE WATER FLOW).
W69-04680 04C

PRECIPITATION(ATMOSPHERIC)
CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

MARKOV CHAINS OF ORDER GREATER THAN ONE,
W69-04238 02B

WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
W69-04239 02B

PROBABILITY
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

PROCEDURE
STATE OF TEXAS V CHUOKE (OWNERSHIP OF SUBMERGED LANDS).
W69-04383 06E

PRODUCTION
ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
W69-04524 02K

PRODUCTIVITY
MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
W69-04334 02L

ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
W69-04339 06B

ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
W69-04524 02K

PROJECT BENEFITS
BENEFIT-COST ANALYSIS FOR WATER RESOURCES PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY.
W69-04629 06B

PROJECT FEASIBILITY
CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
W69-04459 08C

PROJECT PLANNING
CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

PROJECTS
FLOOD CONTROL PROJECTS - LAND ACQUISITION, MAINTENANCE AND OPERATION.
W69-04403 04A

PROTEINS
FISH PROTEIN CONCENTR)TE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

PUBLIC BENEFITS
GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

BENEFIT-COST ANALYSIS ITS RELEVANCE TO PUBLIC INVESTMENT DECISIONS,
W69-04479 06B

DECLARATION OF POLICY.
W69-04694 06E

PUBLIC HEALTH
COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
W69-04344 05G

SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
W69-04366 05B

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
W69-04392 05G

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.
W69-04396 05G

LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
W69-04410 06E

ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.
W69-04411 06E

MOSQUITO EXTERMINATION.
W69-04421 06E

NUISANCES AFFECTING HEALTH.
W69-04424 05G

DECLARATION AND ABATEMENT OF NUISANCES.
W69-04425 05G

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.
W69-04428 05G

PUBLIC NUISANCE DEFINED.
W69-04660 06E

PUBLIC LANDINGS
WATER FRONT IMPROVEMENTS.
W69-04692 04A

PUBLIC POLICY
DECLARATION OF POLICY.
W69-04694 06E

PUBLIC RESORT
CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

PUBLIC UTILITIES
PUBLIC UTILITIES - CONSTRUCTION AND OPERATION OF DAMS.
W69-04406 04A

MALONE V CUSTOM MANOR (PRIVATE WATER LINES).
W69-04675 06E

TOWN OF GREENWICH V GREENWICH WATER CO (PUBLIC UTILITY RIVER DIVERSION).
W69-04688 06D

PUBLIC WORKS
BOARD OF PUBLIC WORKS.
W69-04413 06E

PUBLICATIONS
FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
W69-04616 02E

PULP AND PAPER INDUSTRY
POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
W69-04319 05G

STATEMENT,
W69-04354 05G

PUMP TESTING
TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

PUMPING
DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

QUALITY CONTROL
WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
W69-04516 05G

RADIOACTIVE DATING
GEOLOGY OF GLACIAL LAKE AGASSIZ,
W69-04617 02H

RADIOACTIVE WASTE DISPOSAL
TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
W69-04229 05E

POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
W69-04272 05E

RADIOACTIVITY
THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

RADIOACTIVITY EFFECTS
THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

RADIUM RADIOISOTOPES
ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

RAINFALL DISPOSITION
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

RAINFALL-RUNOFF RELATIONSHIPS
GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
W69-04570 02E

EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
W69-04632 04C

WATERSHED CALIBRATION METHODS,
W69-04634 03B

EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

REAERATION
EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
W69-04468 05G

THE AERATION CAPACITY OF STREAMS,
W69-04628 02E

REASONABLE USE
POIRE V SERRA (INJUNCTION PROHIBITING THE FILLING IN OF A RIVER).
W69-04376 06E

CAPITAL V PORT WASHINGTON YACHT CLUB (ACTION FOR LATERAL SUPPORT OF LAND, WITH ADDITIONAL CLAIMS FOR SURFACE WATER DAMAGE).
W69-04672 06E

BOROUGH OF WESTVILLE V WHITNEY HOME BUILDERS (SEWAGE EFFLUENTS FLOWING INTO CITY RECREATION AREA LAKE).
W69-04677 05G

JONES V OZ-ARK-VAL POULTRY CO (RIGHT TO THE USE OF SUBTERRANEAN WATERS).
W69-04690 06D

EQUITABLE GAS CO V ROCCA (RIGHTS OF LANDOWNER TO CONSTRUCT A RESERVOIR OVER AN EASEMENT ON THAT LAND).
W69-04700 06E

RECLAMATION
1967 PROCEEDINGS OF WODCON.
W69-04321 04A

RECREATION
STATEMENT,
W69-04303 06B

LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
W69-04410 06E

ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.
W69-04411 06E

RECREATION,
W69-04458 06B

POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES.
W69-04490 05G

BENEATH THE SURFACE,
W69-04497 06B

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

TOURISM AND RECREATION.
W69-04510 06B

RECREATION DEMAND
RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

COMPARISONS OF METHODS FOR RECREATION EVALUATION,
W69-04474 06B

ON THE USES AND ABUSES OF ECONOMIC SCIENCE IN EVALUATING PUBLIC OUTDOOR RECREATION,
W69-04500 06B

RECREATION FACILITIES
PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
W69-04355 06B

RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

RECREATION WASTES
STATEMENT,
W69-04303 06B

RECREATIONAL FACILITIES
CONSTRUCTION OF CONVENTION HALL PIER.
W69-04412 04A

REGIONAL ANALYSIS
SUMMARY ECONOMIC BASE STUDY CHESAPEAKE BAY DRAINAGE BASINS.
W69-04346 06B

REGIONAL LIMNOLOGY
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

REGULATION
PUBLIC SWIMMING POOLS AND PLACES.
W69-04422 06E

RELATIVE RIGHTS
WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
W69-04649 06E

REMOTE SENSING
INFRARED IMAGING FOR WATER RESOURCES STUDIES,
W69-04556 07B

REPULSION(LEGAL ASPECTS)
HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).
W69-04429 04A

RESEARCH AND DEVELOPMENT
THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
W69-04347 04A

WATER RESOURCES RESEARCH CATALOG.
W69-04360 09D

RESERVOIR CONSTRUCTION
EQUITABLE GAS CO V ROCCA (RIGHTS OF LANDOWNER TO CONSTRUCT A RESERVOIR OVER AN EASEMENT ON THAT LAND).
W69-04700 06E

RESERVOIR OPERATION
KEY SALES CO V SOUTH CAROLINA ELECTRIC AND GAS CO (DAM OPERATOR'S DUTY OF CARE IN REGARD TO FLOODING OF DOWNSTREAM PROPERTY).
W69-04665 04A

RESERVOIR STORAGE
ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

RESERVOIRS
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

RESISTIVITY
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

RESORTS
LAND BORDERING ON AND ADJACENT TO OCEAN MAY BE ACQUIRED FOR PLACES OF PUBLIC RESORT. REFERENDUM OF QUESTION OF ADOPTION OF ACT.
W69-04410 06E

ACQUISITION OF LANDS BORDERING AND ADJACENT TO THE OCEAN.
W69-04411 06E

RESOURCE ALLOCATION
'NATURAL RESOURCES AND THE QUALITY OF LIFE',
W69-04440 06B

REVENUE BONDS

WATER FRONT IMPROVEMENTS.
W69-04692 04A

REVIEWS
NEW HORIZONS IN THE FIELD OF TIDAL HYDRAULICS,
W69-04579 02L

RHONE
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

RIDDANCE(LEGAL ASPECTS)
HOPLER V MORRIS HILLS REGIONAL DISTRICT (LIABILITY FOR DISCHARGING SURFACE WATERS).
W69-04429 04A

RIGHT-OF-WAY
SEABOARD AIR LINE RAILROAD CO V SARASOTA-FRUITVILLE DRAINAGE DISTRICT (DRAINAGE WATER DAMAGES).
W69-04682 04A

EQUITABLE GAS CO V ROCCA (RIGHTS OF LANDOWNER TO CONSTRUCT A RESERVOIR OVER AN EASEMENT ON THAT LAND).
W69-04700 06E

RIPARIAN RIGHTS
PAXSON V COLLINS (TITLE TO ACCRETION AND RELICTION).
W69-04368 06E

HUEY V KELLER (RIGHTS OF UPPER RIPARIAN OWNER).
W69-04373 04A

POIRE V SERRA (INJUNCTION PROHIBITING THE FILLING IN OF A RIVER).
W69-04376 06E

YOUNG V CITY OF ASHEVILLE (RIPARIAN RIGHTS).
W69-04378 06E

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
W69-04382 05G

WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
W69-04649 06E

KEY SALES CO V SOUTH CAROLINA ELECTRIC AND GAS CO (DAM OPERATOR'S DUTY OF CARE IN REGARD TO FLOODING OF DOWNSTREAM PROPERTY).
W69-04665 04A

BOROUGH OF WESTVILLE V WHITNEY HOME BUILDERS (SEWAGE EFFLUENTS FLOWING INTO CITY RECREATION AREA LAKE).
W69-04677 05G

RIVER BASIN COMMISSIONS
ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

RIVER BASIN DEVELOPMENT
METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

A RIVER HARNESSED THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
W69-04594 04A

LOA RIVER BASIN WATER RESOURCES AND THEIR DISTRIBUTION,
W69-04613 04A

ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

RIVER BASINS
WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
W69-04359 05G

RIVER BEDS
CHEROKEE NATION OR TRIBE OF INDIANS IN OKLAHOMA V OKLAHOMA (RIGHT TO RIVERBEDS OF ARKANSAS RIVER).
W69-04651 06E

RIVER FLOW
CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

RIVER METAMORPHOSIS
RIVER METAMORPHOSIS,
W69-04583 02E

RIVER REGULATION
TIDEWATER NAVIGATION.
W69-04398 04A

RIVER IMPROVEMENT.
W69-04401 04A

RIVER SYSTEMS
TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

RIVERS
INTERNAL IMPROVEMENT FUND OF STATE OF FLORIDA V MOWAK (USE OF MEANDER LINES IN SETTING BOUNDARIES OF RIPARIAN PROPERTY).
W69-04374 06E

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO,
W69-04598 02E

RIVER-BASIN DEVELOPMENT
USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
W69-04596 04A

ROAD CONSTRUCTION
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

ROADS
STORMWATER SEWERS FOR COUNTY ROADS MUNICIPAL COOPERATION.
W69-04418 04C

ROUTING
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

RUNOFF
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

GLACIERS AND WATER SUPPLY,
W69-04255 02C

SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

SAFETY
PUBLIC SWIMMING POOLS AND PLACES.
W69-04422 06E

PUBLIC NUISANCE DEFINED.
W69-04660 06E

SALINE WATER
SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

SALINE WATER INTRUSION
DELAWARE RIVER MODEL STUDY REPORT NO. 2 - SALINITY TESTS OF EXISTING CHANNEL.
W69-04466 02L

SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

SALINE WATER RESOURCES
SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

SALINE WATER-FRESHWATER INTERFACES
A NOTE ON THE GHYBEN-HERZBERG FORMULA,
W69-04569 02F

SALINITY
CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

SAMPLING
1967 PROCEEDINGS OF WODCON.
W69-04321 04A

SAN FRANCISCO BAY
SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

SANDS
TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

SANITARY ENGINEERING
STATE SANITARY CODE.
W69-04395 05G

SATURATION
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,

W69-04242 02G

SCENERY
THE BUFFALO SCENIC RIVERWAY.
W69-04201 06B

SEA LEVEL
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

SEA WATER
LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

SECONDARY RECOVERY(OIL)
WHAT'S AHEAD IN OIL RECOVERY,
W69-04335 05G

SEDIMENT DISCHARGE
DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
W69-04554 02J

SEDIMENT TRANSPORT
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

SEDIMENT YIELD
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

SEDIMENTARY ENVIRONMENT
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

SEDIMENTATION
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
W69-04554 02J

RIVER METAMORPHOSIS,
W69-04583 02E

SEDIMENTS
1967 PROCEEDINGS OF WODCON.
W69-04321 04A

THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

SEISMIC STUDIES
SEISMIC EXPLORATION AT SEA,
W69-04294 07B

REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
W69-04607 02E

SETBACK LINES
COUNTY ZONING.
W69-04386 06E

SEWAGE
RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
W69-04392 05G

COUNTY SEWERAGE AUTHORITIES.
W69-04415 05G

THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
W69-04445 05C

DEPARTMENT OF HEALTH V PASSAIC VALLEY SEWERAGE COMMISSION (DEPARTMENT OF HEALTH'S AUTHORITY OF DISCHARGE OF SEWERAGE).
W69-04664 05G

SEWAGE DISPOSAL
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

BOROUGH OF WESTVILLE V WHITNEY HOME BUILDERS (SEWAGE EFFLUENTS FLOWING INTO CITY RECREATION AREA LAKE).
W69-04677 05G

SEWAGE DISTRICTS
COUNTY SEWERAGE AUTHORITIES.
W69-04415 05G

SEWAGE EFFLUENTS
THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

SEWAGE SYSTEMS
BOARD OF PUBLIC WORKS.
W69-04413 06E

SEWAGE TREATMENT
STATEMENT,
W69-04306 05D

DEEDS AND DATA.
W69-04465 05D

SEWERS
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

WATER POLLUTION CONTROL FACTS.
W69-04515 05G

SHELLFISH
VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
W69-04344 05G

OWNERS OF MARSH AND MEADOW LANDS.
W69-04431 06E

GENERAL POWERS AND DUTIES.
W69-04434 06E

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

SHIPS
MARITIME AGENCY STATUS, CHANNEL PROBLEMS CREATED BY HUGE SHIPS CONCERNS OF AAPA.
W69-04287 04A

REMARKS BY BRIGADIER GENERAL JOHN A. B. DILLARD, DIVISION ENGINEER, SOUTH PACIFIC.
W69-04324 04A

RULES ON VESSEL POLLUTION PROPOSED BY SENATOR MUSKIE.
W69-04332 05G

SEAFARING EMPLOYMENT.
W69-04336 06B

WASTE FROM WATERCRAFT.
W69-04357 05G

THE CONTRIBUTION OF THE AMERICAN MERCHANT MARINE TO THE U. S. BALANCE OF PAYMENTS.
W69-04460 06C

POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES.
W69-04490 05G

SHORES
THE PRINCIPLES OF WATERFRONT RENEWAL A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
W69-04476 06B

SHRIMP
NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

SILICA
SILICA IN ALKALINE BRINES,
W69-04270 02K

SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

SILTING
OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

SIMULATION ANALYSIS
DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
W69-04312 06G

SINKS
FINLEY V TEETER STONE INC (ACTION FOR DAMAGES DUE TO PUMPING PERCOLATING WATERS).
W69-04371 04C

SITES
WATERSIDE SITE PLANT LOCATIONS AND EXPANSIONS 1966.
W69-04361 04A

SIZE
RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

SLUDGE
ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
W69-04248 05C

SLUSH PITS
BLUE V CHARLES P HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).
W69-04654 05B

SNOW MANAGEMENT
OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

SNOWMELT
THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
W69-04570 02E

SNOWPACKS
A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

SOCIAL VALUES
'NATURAL RESOURCES AND THE QUALITY OF LIFE',
W69-04440 06B

WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
W69-04457 05G

SOIL ANALYSIS
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

SOIL AND WATER CONSERVATION DISTRICTS
SOIL AND WATER CONSERVATION DISTRICTS.
W69-04381 06E

SOIL CHEMISTRY
GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

SOIL CONSERVATION
SOIL AND WATER CONSERVATION DISTRICTS.
W69-04381 06E

SOIL INVESTIGATIONS
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

SOIL LEACHING
SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

SOIL MOISTURE
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

SOIL PHYSICAL PROPERTIES
THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

SOIL STRUCTURE
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS 2. WATER MOVEMENT,
W69-04589 02G

A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

SOIL TEXTURE
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

SOIL WATER
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

SOIL WATER MOVEMENT
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
W69-04242 02G

INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS 2. WATER MOVEMENT,
W69-04589 02G

SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

SOIL-WATER-PLANT RELATIONS
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

SOLUBILITY
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

SOUTH CAROLINA
RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).
W69-04372 05B

SPATIAL DISTRIBUTION
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

SPECTROPHOTOMETRY
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

SPORT FISHING
IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

STATEMENT,
W69-04303 06B

MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
W69-04362 06B

MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

SPRINGS
RANDALL V CLIFFORD (POLLUTION AND DESTRUCTION OF WATER SUPPLY).
W69-04678 05G

STABILITY
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

STANDARDS
A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
W69-04222 05A

WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
W69-04457 05G

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
W69-04516 05G

DEPARTMENT OF WATER AND AIR RESOURCES ORGANIZATION AND POWERS GENERALLY CONTROL OF POLLUTION.
W69-04687 05G

STATE JURISDICTION
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

STATISTICAL METHODS
A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
W69-04582 02E

STATISTICS
STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
W69-04341 06E

WATERSIDE SITE PLANT LOCATIONS AND EXPANSIONS 1966.
W69-04361 04A

BENEATH THE SURFACE,
W69-04497 06B

WATER POLLUTION CONTROL FACTS.
W69-04515 05G

STATUTES
SOIL AND WATER CONSERVATION DISTRICTS.
W69-04381 06E

STEAM TURBINES
STEAM-ELECTRIC PLANT CONSTRUCTION COST AND ANNUAL PRODUCTION EXPENSES--1965.
W69-04503 08B

STOCHASTIC PROCESSES
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

STORAGE
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

STORM DRAINS
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

STREAM CHANNELS
TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
W69-04203 02E

STREAM TURBINES
THERMAL POLLUTION OF WATER.
W69-04349 05C

STREAMFLOW
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
W69-04565 02E

A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
W69-04568 02E

DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

COMPILATION OF HYDROLOGIC DATA, WALLER AND WILBARGER CREEKS, COLORADO RIVER BASIN, TEXAS-1966.
W69-04599 02E

STREAMFLOW ESTIMATION
DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

STREAMFLOW FORECASTING
DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

STREAMS
WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
W69-04516 05G

FRYE V PENNSYLVANIA RAILROAD CO (RAILROAD'S LIABILITY FOR NEGLIGENTLY MAINTAINING CULVERT THROUGH RIGHT-OF-WAY).
W69-04683 06E

SUBMERGED ISLANDS
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

SUBMERGED LANDS
ANNEXATION OF SUBMERGED LANDS.
W69-04387 06E

SUBSURFACE DRAINAGE
BURR V ADAM EIDEMILLER, INC (SUBSURFACE POLLUTION OF WATER SUPPLY).
W69-04681 05G

SUBSURFACE FLOW
SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

SUBSURFACE RUNOFF
SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

BURR V ADAM EIDEMILLER, INC (SUBSURFACE POLLUTION OF WATER SUPPLY).
W69-04681 05G

SULFIDES
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

SULFUR
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

SULFUR COMPOUNDS
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

SUPERVISORY CONTROL
HEALTH AND VITAL STATISTICS COUNTY BOARD OF HEALTH.
W69-04420 05G

SUPPLY CONTRACTS
NORTH JERSEY DIST WATER SUPPLY COMM'N V CITY OF NEWARK (RESCISSION OF WATER SUPPLY CONTRACTS).
W69-04408 06E

SURFACE DRAINAGE
GELLIS V TOWN OF HARRISON (INCREASED SURFACE RUNOFF).
W69-04676 04C

SURFACE RUNOFF
SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

GELLIS V TOWN OF HARRISON (INCREASED SURFACE RUNOFF).
W69-04676 04C

BATTISTO V PERKINS (ACTION FOR DAMAGE FROM INCREASED SURFACE WATER FLOW).
W69-04680 04C

SURFACE WATER
WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

SURFACE WATERS
SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
W69-04565 02E

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
W69-04586 02K

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

KERHONKSON LODGE INC V STATE OF NEW YORK (ACTION FOR DAMAGE FROM SURFACE WATER DISCHARGE).
W69-04673 04C

SURVEYS
STATE AND LOCAL GOVERNMENT ACTIVITIES AND ROLES IN MARINE SCIENCE, ENGINEERING AND DEVELOPMENT. A BRIEFLY ANNOTATED CATALOG OF PUBLISHED STUDIES AND REPORTS ON SUCH ORGANIZATIONAL ARRANGEMENTS AND ACTIVITIES IN THE COASTAL STATES AND IN THOSE BORDERING ON THE GREAT LAKES.
W69-04341 06E

COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
W69-04505 06B

A SUPPLEMENTARY REPORT ON THE COASTAL WETLANDS INVENTORY OF LONG ISLAND, NEW YORK.
W69-04506 07B

WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

SWAMPS
BILL OF RIGHTS.
W69-04658 04A

SWIMMING POOLS
PUBLIC SWIMMING POOLS AND PLACES.
W69-04422 06E

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).
W69-04668 05G

SYNOPTIC ANALYSIS
WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
W69-04239 02B

ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
W69-04246 02A

SYNTHETIC HYDROLOGY
A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
W69-04568 02E

SYSTEMS ANALYSIS
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
W69-04482 06B

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

THE POLITICAL ECONOMY OF EFFICIENCY COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
W69-04519 06B

TECHNOLOGY
TECHNOLOGY ADDING BILLIONS TO RESERVES.
W69-04348 06B

TEMPERATURE
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

TENNESSEE VALLEY AUTHORITY PROJECT
HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

TERTIARY TREATMENT
OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
W69-04230 05D

TEXAS
REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
W69-04327 05G

PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
W69-04362 06B

MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
W69-04436 06B

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
W69-04586 02K

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

THERMAL POLLUTION
THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
W69-04244 02L

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

THERMAL POLLUTION HOT ISSUE FOR INDUSTRY,
W69-04325 05C

STATEMENT.
W69-04342 05G

THERMAL POLLUTION OF WATER,
W69-04345 05C

THERMAL POLLUTION OF WATER.
W69-04349 05C

COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
W69-04486 05C

ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

THERMAL POWERPLANTS
PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
W69-04244 02L

THERMAL POLLUTION HOT ISSUE FOR INDUSTRY,
W69-04325 05C

THERMAL POLLUTION OF WATER.
W69-04349 05C

THERMAL PROPERTIES
THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

THERMAL STRATIFICATION
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

THERMAL WATER
EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

THERMOMETERS
A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

TIDAL EFFECTS
CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

NEW HORIZONS IN THE FIELD OF TIDAL HYDRAULICS,
W69-04579 02L

USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
W69-04580 02L

TIDAL ENERGY
CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
W69-04459 08C

TIDAL MARSHES
NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

TIDAL POWERPLANTS
CONSERVATION OF THE NATURAL RESOURCES OF NEW ENGLAND, THE PASSAMAQUODDY TIDAL POWER PROJECT AND UPPER SAINT JOHN RIVER HYDROELECTRIC DEVELOPMENT.
W69-04459 08C

TIDAL WATERS
PROTECTION OF ROADS NEAR TIDEWATER ACQUISITION OF LANDS.
W69-04419 06E

THE MIXING PROCESSES IN A TIDAL ESTUARY,
W69-04444 02L

TIMBER HARVEST
EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
W69-04632 04C

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

TOURISM
TOURISM AND RECREATION.
W69-04510 06B

TRACE ELEMENTS
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

TRACERS
DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

TRAINING
THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

TRANSMISSIVITY
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

TRANSPORTATION
LONG ISLAND BEACH BUGGY ASS'N V TOWN OF ISLIP (BEACH EROSION).
W69-04389 04D

THE CONTRIBUTION OF THE AMERICAN MERCHANT MARINE TO THE U. S. BALANCE OF PAYMENTS.
W69-04460 06C

TRAWLING
THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

TREATIES
ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
W69-04648 06E

TURBINE GASES
THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION

OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

TURBINES
THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

TURBULENCE
EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
W69-04468 05G

SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

UNDERGROUND STORAGE
FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

UNDERWATER
PLAN DEVELOPING FOR UNDERWATER PARKS.
W69-04317 06B

UNIT HYDROGRAPHS
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

UNITED STATES
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

HARRIS V UNITED STATES (NEGLIGENCE OF TVA UNDER FEDERAL TORT CLAIMS ACT).
W69-04370 06E

UNITED STATES V REPUBLIC STEEL CORP (INJUNCTION TO FORCE COMPANY TO RESTORE RIVER TO ORIGINAL DEPTH).
W69-04671 06E

UNIVERSITIES
THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

URANIUM RADIOISOTOPES
ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

URBAN HYDROLOGY BIBLIOGRAPHY
EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

URBANIZATION
IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
W69-04548 04C

EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

COMPILATION OF HYDROLOGIC DATA, WALLER AND WILBARGER CREEKS, COLORADO RIVER BASIN, TEXAS-1966.
W69-04599 02E

UREA PESTICIDES
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

UTAH
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

UTILITIES
BOARD OF PUBLIC WORKS.
W69-04413 06E

VALUE
IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
W69-04353 05G

MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
W69-04436 06B

MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

VANADIUM
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

VEGETATION EFFECTS
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

VERMONT
RANDALL V CLIFFORD (POLLUTION AND DESTRUCTION OF WATER SUPPLY).
W69-04678 05G

VILLAGES
GENERAL POWERS OF THE BOARD OF TRUSTEES.
W69-04393 04A

VIOLATIONS
HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

VIRGIN ISLANDS
BENEATH THE SURFACE,
W69-04497 06B

VIRGINIA
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

MEASURING THE IMPACT OF THE WATERBORNE COMMERCE OF THE PORTS OF VIRGINIA ON EMPLOYMENT, WAGES, AND OTHER KEY INDICES OF THE VIRGINIA ECONOMY, 1953-1965.
W69-04295 06B

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
W69-04314 06G

THE SEAFOOD INDUSTRY, A LOCAL ANALYSIS.
W69-04337 06B

CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
W69-04449 06B

LITTERING AND OBSTRUCTIONS,
W69-04450 06E

RECREATION,
W69-04458 06B

WASHINGTON
POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
W69-04319 05G

SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,
W69-04439 05B

WASHOUTS
KERHONKSON LODGE INC V STATE OF NEW YORK (ACTION FOR DAMAGE FROM SURFACE WATER DISCHARGE).
W69-04673 04C

WASTE ASSIMILATIVE CAPACITY
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
W69-04456 05C

PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
W69-04489 05G

WASTE DILUTION
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

WASTE DISPOSAL
SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,
W69-04228 05E

EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

HOUSEBOATS, SANITATION AND LOCATION.
W69-04388 05G

'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,

W69-04581 02L

WASTE DUMPS
POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
W69-04272 05E

WASTE TREATMENT
TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
W69-04229 05E

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

WASTE WATER DISPOSAL
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

WASTE WATER TREATMENT
WATER REUSE FOR PUBLIC SUPPLY,
W69-04265 05D

OPERATING COSTS OF WASTE TREATMENT IN GENERAL MOTORS,
W69-04451 05D

INDUSTRIAL WASTEWATER CONTROL,
W69-04471 05D

WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

WASTES
WASTE FROM WATERCRAFT.
W69-04357 05G

THE DISCHARGE OF SEWAGE AND OTHER MATTER INTO CERTAIN WATERS IS PROHIBITED.
W69-04391 05B

LITTERING AND OBSTRUCTIONS,
W69-04450 06E

WATER ANALYSIS
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

WATER CHEMISTRY
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

GEOCHEMISTRY OF NATURAL WATERS,
W69-04562 02K

A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

WATER CONSERVATION
SOIL AND WATER CONSERVATION DISTRICTS.
W69-04381 06E

DEPARTMENT OF WATER AND AIR RESOURCES ORGANIZATION AND POWERS GENERALLY CONTROL OF POLLUTION.
W69-04687 05G

DECLARATION OF POLICY.
W69-04694 06E

WATER CONTRACTS
MALONE V CUSTOM MANOR (PRIVATE WATER LINES).
W69-04675 06E

WATER CONVEYANCE
MALONE V CUSTOM MANOR (PRIVATE WATER LINES).
W69-04675 06E

WATER COOLING
A COOLING POND PROVES CHEAPER,
W69-04447 05C

WATER DEMAND
ECONOMIC AND ENGINEERING ASPECTS OF WATER IN DELAWARE'S AGRI BUSINESS INDUSTRY,
W69-04204 03F

'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

WATER DISTRIBUTION(APPLIED)
LOA RIVER BASIN WATER RESOURCES AND THEIR DISTRIBUTION,
W69-04613 04A

TOWN OF GREENWICH V GREENWICH WATER CO (PUBLIC UTILITY RIVER DIVERSION).
W69-04688 06D

WATER DISTRICTS
WATER DISTRICTS.
W69-04655 04A

WATER LAW
GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
W69-04649 06E

WATER LEVEL FLUCTUATIONS
KEY SALES CO V SOUTH CAROLINA ELECTRIC AND GAS CO (DAM OPERATOR'S DUTY OF CARE IN REGARD TO FLOODING OF DOWNSTREAM PROPERTY).
W69-04665 04A

WATER LEVELS
HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
W69-04267 03D

WATER MANAGEMENT
WATER QUALITY MANAGEMENT AND CONTROL.
W69-04404 05G

NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

WATER MANAGEMENT(APPLIED)
SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
W69-04231 04B

MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

WATER POLICY
NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
W69-04644 06E

ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

WATER POLLUTION
WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
W69-04223 05B

A PROBABILISTIC ANALYSIS OF DISSOLVED OXIGEN-BIOCHEMICAL OXIGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

ILLINOIS GROUND WATER POLLUTION,
W69-04256 05B

ESTUARIES,
W69-04278 02L

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES.
W69-04285 05G

A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

STATEMENT,
W69-04303 06B

OIL SPILLAGE STUDY LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
W69-04309 05G

POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

VANISHING TIDELANDS,
W69-04323 06E

A REPORT ON POLLUTION OF THE NATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES.
W69-04326 05G

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
W69-04344 05G

RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

WASTE FROM WATERCRAFT.
W69-04357 05G

NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

RIDDLE V CITY OF GREENVILLE (RIGHT TO COLLECT DAMAGES FROM POLLUTION OF STREAMS).
W69-04372 05B

YOUNG V CITY OF ASHEVILLE (RIPARIAN RIGHTS).
W69-04378 06E

CLARK V LINDSAY LIGHT AND CHEMICAL COMPANY (INJUNCTION FOR POLLUTION ABATEMENT).
W69-04382 05G

AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES.
W69-04490 05G

BIBLIOGRAPHY ON AIR AND WATER POLLUTION,
W69-04496 05G

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

BLUE V CHARLES P HAYES AND ASSOCIATES, INC (ACTION FOR DAMAGES DUE TO FLOW OF OIL WASTES).
W69-04654 05B

THROWING GAS TAR OR REFUSE INTO PUBLIC WATERS AND WILLFULLY POISONING FOOD.
W69-04659 05G

TOWN OF PALM BEACH SHORES V COLONNADES, INC (OCEAN POLLUTION).
W69-04668 05G

RANDALL V CLIFFORD (POLLUTION AND DESTRUCTION OF WATER SUPPLY).
W69-04678 05G

BURR V ADAM EIDEMILLER, INC (SUBSURFACE POLLUTION OF WATER SUPPLY).
W69-04681 05G

WATER POLLUTION CONTROL
OIL SPILL RELIEF SEEN SOON.
W69-04308 05B

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
W69-04319 05G

A REPORT ON POLLUTION OF THE NATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES.
W69-04326 05G

RULES ON VESSEL POLLUTION PROPOSED BY SENATOR MUSKIE.
W69-04332 05G

SAVING OUR ESTUARIES.
W69-04333 05G

WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
W69-04359 05G

SHIRLEY V NEW HAMPSHIRE WATER POLLUTION COMMISSION (VALIDITY OF ORDER TO DESIST SEWAGE DEPOSIT INTO RIVER).
W69-04366 05B

WATER IMPROVEMENT COMMISSION.
W69-04377 05G

PUBLIC HEALTH LAW (CLASSIFICATION OF WATERS AND PREVENTION OF POLLUTION).
W69-04392 05G

NUISANCES AFFECTING HEALTH.
W69-04424 05G

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.
W69-04428 05G

'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

INDUSTRIAL WASTEWATER CONTROL,
W69-04471 05D

RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

1965 SURVEY ON DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES BY FEDERAL INSTALLATIONS.
W69-04507 05D

RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

WATER POLLUTION CONTROL FACTS.
W69-04515 05G

OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

DEPARTMENT OF HEALTH V PASSAIC VALLEY SEWERAGE COMMISSION (DEPARTMENT OF HEALTH'S AUTHORITY OF DISCHARGE OF SEWERAGE).
W69-04664 05G

WATER POLLUTION EFFECTS
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

SPILL POLLUTION - ITS EFFECTS AND CONTROL,
W69-04322 05G

THERMAL POLLUTION OF WATER,
W69-04345 05C

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
W69-04353 05G

THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
W69-04445 05C

ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
W69-04456 05C

THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

WATER POLLUTION IDENTIFICATION
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

WATER POLLUTION SOURCES
CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
W69-04227 05B

OIL SPILL RELIEF SEEN SOON.
W69-04308 05B

POLICING THE OIL INDUSTRY.
W69-04318 05B

WATER POLLUTION TREATMENT
A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES.
W69-04285 05G

SPILL POLLUTION - ITS EFFECTS AND CONTROL,
W69-04322 05G

WATER PROPERTIES
ESTUARIES,
W69-04278 02L

WATER PURIFICATION
SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.
W69-04390 05G

STATE SANITARY CODE.
W69-04395 05G

WATER QUALITY
A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
W69-04222 05A

FRESH WATER,
W69-04225 03B

VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
W69-04268 02F

THE FUTURE OF AN ESTUARY,
W69-04290 05G

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
W69-04327 05G

STATEMENT,
W69-04354 05G

WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
W69-04359 05G

SANITARY QUALITY OF WATER IN SWIMMING POOLS AND AT BATHING BEACHES.
W69-04396 05G

WATER QUALITY MANAGEMENT AND CONTROL.
W69-04404 05G

NUTRIENTS,
W69-04408 05C

WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
W69-04457 05G

CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
W69-04489 05G

WATER QUALITY CRITERIA--STREAM VERSUS EFFLUENT STANDARDS.
W69-04516 05G

WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
W69-04565 02E

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
W69-04586 02K

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

WATER QUALITY CONTROL
THE FUTURE OF AN ESTUARY,
W69-04290 05G

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

STATEMENT,
W69-04306 05D

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

THERMAL POLLUTION OF WATER,
W69-04345 05C

WATER IMPROVEMENT COMMISSION.
W69-04377 05G

CONSERVATION LAW.
W69-04400 05G

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
W69-04502 05G

MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

WATER REQUIREMENTS
ECONOMIC AND ENGINEERING ASPECTS OF WATER IN DELAWARE'S AGRI BUSINESS INDUSTRY,
W69-04204 03F

WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

WATER RESOURCES
FRESH WATER,
W69-04225 03B

REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
W69-04343 05G

MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
W69-04436 06B

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
W69-04564 02F

WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

DECLARATION OF POLICY.
W69-04694 06E

WATER RESOURCES DEVELOPMENT
FRESH WATER,
W69-04225 03B

PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
W69-04355 06B

WATER RESOURCES RESEARCH CATALOG.
W69-04360 09D

CONSERVATION LAW.
W69-04400 05G

INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
W69-04427 03D

FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
W69-04472 06B

A TEN-YEAR PROGRAM OF FEDERAL WATER RESOURCES RESEARCH.
W69-04473 06B

METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

LOA RIVER BASIN WATER RESOURCES AND THEIR DISTRIBUTION,
W69-04613 04A

WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
W69-04646 06B

WATER RESOURCES PLANNING
FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
W69-04646 06B

WATER RETENTION
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

WATER REUSE
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

WATER REUSE FOR PUBLIC SUPPLY,
W69-04265 05D

WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

WATER RIGHTS
WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
W69-04649 06E

WATER SOURCES
GLACIERS AND WATER SUPPLY,
W69-04255 02C

DRINKING WATER SUPPLIES.
W69-04394 05F

IRRIGATION SYSTEMS (ESTABLISHING IRRIGATION SYSTEMS IN NEW JERSEY COUNTIES).
W69-04416 03F

SALINE WATER CONVERSION REPORT.
W69-04498 03A

WATER SPORTS
BENEATH THE SURFACE,
W69-04497 06B

WATER SUPPLY
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

WATERWORKS AND WATER SUPPLIES.
W69-04367 04A

STATE SANITARY CODE.
W69-04395 05G

INTERSTATE COOPERATION FOR CONSERVATION AND PROTECTION OF WATER RESOURCES.
W69-04427 03D

LOCAL BOARDS OF HEALTH - GENERAL POWERS AND DUTIES.
W69-04428 05G

GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

SALINE WATER CONVERSION REPORT.
W69-04498 03A

WATER DISTRICTS.
W69-04655 04A

HUNTER V CITY OF SHREVEPORT (BRIDGE CONSTRUCTION).
W69-04667 06E

PUBLIC UTILITIES METHODS OF SUPPLYING WATER.
W69-04695 03D

PUBLIC UTILITIES MUNICIPALITY AND ITS EXCLUSIVE RIGHT TO SUPPLY WATER.
W69-04696 03D

WATER SUPPLY.
W69-04697 03D

WATER SUPPLY COMMISSION
WATER SUPPLY.
W69-04697 03D

WATER TABLE
REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
W69-04607 02E

WATER TEMPERATURE
TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
W69-04468 05G

WATER TEMPERATURES IN THE LOWER COLUMBIA RIVER,
W69-04605 02E

WATER TREATMENT
CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
W69-04227 05B

OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
W69-04230 05D

DRINKING WATER SUPPLIES.
W69-04394 05F

STATE SANITARY CODE.
W69-04395 05G

WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
W69-04502 05G

WATER USERS
WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

WATER UTILIZATION
MAJOR USES OF LAND AND WATER IN THE U. S. WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
W69-04208 03F

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
W69-04268 02F

STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
W69-04327 05G

STATEMENT.
W69-04342 05G

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
W69-04353 05G

STATEMENT,
W69-04354 05G

WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

WATER VALUES
MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
W69-04436 06B

WATER VAPOR
ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
W69-04246 02A

WATER WELLS
PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
W69-04573 02F

GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
W69-04615 02F

WATER WORKS
SEWAGE REMOVAL OR PURIFICATION AND CONDEMNATION OF PROPERTY.
W69-04390 05G

WATER DISTRICTS.
W69-04655 04A

WATER-WORKS.
W69-04693 04A

WATER YIELD
GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
W69-04615 02F

WATER YIELD IMPROVEMENT
OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

WATERSHED CALIBRATION METHODS,
W69-04634 03B

WATERCOURSES(LEGAL)
LAWRENCE V BEHNCKE (INTERFERENCE WITH NATURAL WATER COURSE).
W69-04674 04A

WATERFRONT
WATER FRONT IMPROVEMENTS.
W69-04692 04A

WATERSHED MANAGEMENT
EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

WATERSHEDS(BASINS)
SUMMARY ECONOMIC BASE STUDY CHESAPEAKE BAY DRAINAGE BASINS.
W69-04346 06B

WATERWORKS
WATERWORKS AND WATER SUPPLIES.
W69-04367 04A

WAVES(WATER)
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
W69-04241 02L

WEATHER
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

WEATHERING
GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

WEIRS
WHARVES AND FISH WEIRS.
W69-04379 04A

WELLS
CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
W69-04601 02F

WEST VIRGINIA
CAMPBELL BROWN CO, INC V ELKINS (RIVERBED OWNERSHIP).
W69-04691 06E

WETLANDS
STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

A SUPPLEMENTARY REPORT ON THE COASTAL WETLANDS INVENTORY OF LONG ISLAND, NEW YORK.
W69-04506 07B

WILDLIFE CONSERVATION
VANISHING TIDELANDS,
W69-04323 06E

BOARD OF GAME AND FISH COMMISSIONERS POWERS AND DUTIES.
W69-04435 06E

WILDLIFE MANAGEMENT
BOARD OF GAME AND FISH COMMISSIONERS POWERS AND DUTIES.
W69-04435 06E

WRONGFUL DEATH
LITTLE V UNITED STATES (WRONGFUL DEATH LIABILITY FOR DAM MAINTENANCE).
W69-04666 06E

ZONING
STATEMENT,
W69-04306 05D

THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,

W69-04307 06F

COUNTY ZONING.
W69-04386 06E

MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
W69-04512 06F

AUTHOR INDEX

ALLEN, HOWARD E.
FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
W69-04249 04A

ANDERSON, ARVID A.
MARINE RESOURCES OF THE CORPUS CHRISTI AREA,
W69-04436 06B

ARDIS, COLBY V.
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

ARMSTRONG, D. E.
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

ASHCROFT, GAYLEN L.
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

AUBERTIN, GERALD M.
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

AULD, DAVID V.
PROTECTING THE POTOMAC AT WASHINGTON,
W69-04437 05G

'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

BAGLEY, JAY M.
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

BALLANCE, W. C.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

BALLINGER, D. G.
A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
W69-04222 05A

BARNES, C. A.
SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,
W69-04439 05B

BARNETT, HAROLD J.
'NATURAL RESOURCES AND THE QUALITY OF LIFE',
W69-04440 06B

BARNETT, PAUL R.
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

BARNHILL, K. G.
ESTIMATED COST OF DESALTING THREE FLORIDA BRACKISH WATERS,
W69-04441 03A

BARRETT, ELINORE M.
THE CALIFORNIA OYSTER INDUSTRY,
W69-04442 06B

BARRETT, M. J.
PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

BASILIO, ESPILDORA C.
THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

BAUER, DANIEL P.
TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO,
W69-04598 02E

BEG, I. R.
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

BELL, FREDERICK C.
GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

BERG, B.
WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

BERNER, ROBERT A.
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

BIANCHI, W. C.
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

BIGGAR, J. W.
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

BJORKLUND, L. J.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

BLEVINS, ROBERT L.
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

BODMER, RENE
ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

BORMANN, F. H.
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

BORTON, R. L.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

BOWDEN, K. F.
THE MIXING PROCESSES IN A TIDAL ESTUARY,
W69-04444 02L

BOWEN, VAUGHAN T.
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

BOWER, BLAIR T.
MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

BRAARUD, T.
THE EFFECT OF POLLUTION BY SEWAGE UPON THE WATERS OF THE OSLO-FJORD,
W69-04445 05C

BRAMHALL, DAVID F.
A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

BRASWELL, R. W.
A COOLING POND PROVES CHEAPER,
W69-04447 05C

BREHMER, MORRIS L.
NUTRIENTS,
W69-04448 05C

BREWINGTON, M. V.
CHESAPEAKE BAY, A PICTORIAL MARITIME HISTORY,
W69-04449 06B

BRIDGES, WAYNE W.
LITTERING AND OBSTRUCTIONS,
W69-04450 06E

BRINK, ROBERT J.
OPERATING COSTS OF WASTE TREATMENT IN GENERAL MOTORS,
W69-04451 05D

BROOKS, NORMAN H.
DIFFUSION OF SEWAGE EFFLUENT IN AN OCEAN-CURRENT,
W69-04452 05B

BROUSSE, R.
THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

BUEHLER, B.
TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
W69-04203 02E

BUE, CONRAD D.
FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
W69-04616 02E

BURBANK, NATHAN C., JR.
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

BURGESS, FREDRICK J.
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

BUTLER, R. G.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

CABLE, CARL C.
OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

CAMPBELL, C. J.
A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

CAMPBELL, JOHN
A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

CANO, GUILLERMO J.
NATIONAL WATER LAWS AND ADMINISTRATION AS ELEMENTS OF WATER DEVELOPMENT,
W69-04644 06E

CAREY, OMER L.
RECENT DEVELOPMENTS IN EVALUATING RECREATIONAL BENEFITS,
W69-04453 06B

CARTER, H. H.
ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

CARTWRIGHT, KEROS
TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

CASSEL, D. K.
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

CHAMBERS, G. V.
AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

CHAPMAN, W. M.
POLITICS AND THE MARINE FISHERIES,
W69-04455 06E

CHESTERS, GORDON
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

CHESTERS, G.
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

CHRISTIE, E. R.
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

CHURCHILL, M. A.
ANALYSIS OF A STREAM'S CAPACITY FOR ASSIMILATING POLLUTION,
W69-04456 05C

CIRIACY-WANTRUP, S. V.
WATER QUALITY, A PROBLEM FOR THE ECONOMIST,
W69-04457 05G

CLARK, JOHN R.
THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

CLAWSON, MARION
RECREATION,
W69-04458 06B

COCKS, C. A.
ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

COHN, MORRIS M.
FORMULA FOR WATER RESOURCES MANAGEMENT IN NEW YORK STATE,
W69-04646 06B

COLLEYPRIEST, C.
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

COLLIAS, E. E.
SOME CONSIDERATIONS OF OXYGEN UTILIZATION RATES IN PUGET SOUND,
W69-04439 05B

COOTNER, P. H.
'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

CORDOVA, R. M.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

CORY, ROBERT L.
TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

COULOMB, RENE
USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
W69-04596 04A

CREVER, F. E.
THE PROSPECTS FOR DUAL-PURPOSE PLANTS,
W69-04463 03A

CRONIN, E. L.
CHESAPEAKE BAY WATER SUPPLY NEEDS - THE BIOLOGICAL POINT OF VIEW,
W69-04464 03C

DAVENPORT, DAVID C.
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

DAVIDSON, J. M.
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

DAVIES, DELWYN
FRESH WATER,
W69-04225 03B

DAVIS, CHARLES C.
ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
W69-04524 02K

DAVIS, ROBERT K.
COMPARISONS OF METHODS FOR RECREATION EVALUATION,
W69-04474 06B

DAVIS, STANLEY N.
SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

DEGREMONT, G.
CONDITIONS FOR BETTER FILTERED WATER,
W69-04591 05D

DEGUERRERO, L. C.
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

DICKASON, CLIFFORD
MAJOR USES OF LAND AND WATER IN THE U. S. WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
W69-04208 03F

DIGHTMAN, E. A.
CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

DISKIN, MORDECHAI H.
EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

DOONAN, C. J.
GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
W69-04564 02F

DOUGLAS, IAN
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

DOUGLAS, P. A.
THERMAL POLLUTION OF WATER,
W69-04345 05C

DOYLE, ROGER W.
IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

DUEKER, KENNETH J.
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

DUGUID, JAMES OTTO
REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
W69-04607 02E

DURUM, W. H.
THE AERATION CAPACITY OF STREAMS,
W69-04628 02E

DYKSTERHUIS, E. J.
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

EBERT, E. E.
THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

EDEN, EDWIN W., JR.
CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

EDINGER, JOHN E.
HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

EISENLOHR, W. S., JR.
GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

ELLIS, HAROLD H.
WATER RIGHTS AND REGULATION IN THE EASTERN UNITED STATES,
W69-04649 06E

ELMORE, H. L.
EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,

W69-04468 05G

ELSON, JOHN A.
GEOLOGY OF GLACIAL LAKE AGASSIZ,
W69-04617 02H

EMMETT, L. F.
RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

ENGLAND, CHARLES B.
GEOMORPHIC GROUPING OF SOILS IN WATERSHED ENGINEERING,
W69-04207 02E

ENGLAND, C. B.
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

ESCHNER, A. R.
EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

EUGSTER, HANS P.
SILICA IN ALKALINE BRINES,
W69-04270 02K

EWING, BEN B.
A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

FARRELL, J. F.
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

FEIGNER, K. D.
MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

FFOLLIOTT, PETER F.
OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

FINGER, JAMES H.
ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
W69-04248 05C

FLY, C. L.
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

FREY, H. THOMAS
MAJOR USES OF LAND AND WATER IN THE U. S. WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
W69-04208 03F

GAMESON, A. L. H.
PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

GARRISON, J. M.
TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
W69-04203 02E

GEMAEHLING, CLAUDE
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

GEYER, JOHN
HEAT EXCHANGE IN THE ENVIRONMENT,
W69-04467 02A

GIVEN, R. G.
THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

GOOLSBY, D. A.
TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

GOTTFRIED, G. J.
A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

GRAETZ, DONALD A.
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

GRAHAM, K.
FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
W69-04604 02G

GREENBERG, ARNOLD E.
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

GURNHAM, FRED C.
INDUSTRIAL WASTEWATER CONTROL,
W69-04471 05D

GUTHRIE, DONALD
MARKOV CHAINS OF ORDER GREATER THAN ONE,
W69-04238 02B

HAMON, B. V.
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

HANEY, PAUL D.
WATER REUSE FOR PUBLIC SUPPLY,
W69-04265 05D

HANSEN, EDWARD A.
OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

HANSEN, J. A.
MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

HARLEMAN, DONALD R. F.
SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

HARRIS, HOWARD S.
THE FUTURE OF AN ESTUARY,
W69-04290 05G

HASKELL, E. E., JR.
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

HAUG, LESTER A.
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

HAUPT, HAROLD F.
THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
W69-04570 02E

HELLER, J. P.
THE DRYING THROUGH THE TOP SURFACE OF A VERTICAL POROUS COLUMN,
W69-04602 02G

HENDRICKSON, G. E.
GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
W69-04564 02F

HERBERT, L. R.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

HILLER, D. E.
SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

HOLOWAYCHUK, NICHOLAS
A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

HOLTAN, H. N.
GEOMORPHIC GROUPING OF SOILS IN WATERSHED ENGINEERING,
W69-04207 02E

MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

HORNBECK, JAMES W.
EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

HOSMAN, R. L.
GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

HUBER, A. LEON
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

HUTCHINSON, G. EVELYN
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

HUTCHINSON, G. E.
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

IPPEN, ARTHUR T.
SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

JACKSON, DONALD R.
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

JEFFERY, H. G.
RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

JEGLIC, JOHN M.
THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

JEPPSON, ROLAND W.
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
W69-04552 02F

JOHNSON, NOYE M.
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

JONES, BLAIR F.
SILICA IN ALKALINE BRINES,
W69-04270 02K

JONES, W. M.
VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

KELLER, W. D.
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

KELLEY, D. W.
FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
W69-04472 06B

KELNHOFER, GUY J., JR.
METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

KIRBY, R.
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

KISSIN, I. G.
EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

KLEMMER, HOWARD W.
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

KLOHN, WULF
LOA RIVER BASIN WATER RESOURCES AND THEIR DISTRIBUTION,
W69-04613 04A

KNEESE, ALLEN V.
MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

KNETSCH, JACK L.
COMPARISONS OF METHODS FOR RECREATION EVALUATION,
W69-04474 06B

KONRAD, J. G.
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

KOTHANDARAMAN, V.
A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

KRAUSE, ORVILLE E.
MAJOR USES OF LAND AND WATER IN THE U. S. WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
W69-04208 03F

KRUGER, PAUL
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

KRUTILLA, J. V.
THE PUBLIC INTEREST IN PRESERVING NATURAL AREAS,
W69-04475 06D

KUNZE, H. L.
RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

KUNZE, R. J.
FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
W69-04604 02G

KVASOV, D. C.
LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

LABORDE, ALDEN J.
PROBLEMS OF A DRILLING CONTRACTOR,
W69-04275 06C

LACKEY, JAMES B.
NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
W69-04276 05C

LAGER, JOHN A.
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

LAMPE, H. C.
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

LANE, R. W.
WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

LANGBEIN, W. B.
THE AERATION CAPACITY OF STREAMS,
W69-04628 02E

LARSON, T. C.
WATER USE AND RELATED COSTS WITH COOLING TOWERS,
W69-04443 06C

LAUFF, GEORGE H.
ESTUARIES,
W69-04278 02L

LAU, L. STEPHEN
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

LAWHEAD, HARLEY F.
ORGANIZATION FOR THE REGULATION OF LAKE ONTARIO,
W69-04648 06E

LAWLESS, G. P.
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

LEE, GERHARD B.
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

LEE, J. M.
RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

LEFFEL, ERNEST R.
ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

LEGRAND, H. E.
GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
W69-04615 02F

LEHMANN, RICHARD A.
THE PRINCIPLES OF WATERFRONT RENEWAL A SUMMARY OF EXPERIENCE IN FIFTY AMERICAN CITIES,
W69-04476 06B

LEIFESTE, DONALD K.
RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUR RIVER AND CYPRESS CREEK BASINS, TEXAS,
W69-04586 02K

LEIGHTON, D.
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

LENZ, ARNO T.
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

LEOPOLD, LUNA B.
HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
W69-04548 04C

LEVE, G. W.
TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

LEVIEL, R.
CONDITIONS FOR BETTER FILTERED WATER,
W69-04591 05D

LIEBMAN, JON C.
A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

LIKENS, GENE E.
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

LINSTEDT, K. DANIEL
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

LIVINGSTONE, ROBERT, JR.
A PRELIMINARY BIBLIOGRAPHY WITH KWIC INDEX ON THE ECOLOGY OF ESTUARIES AND COASTAL AREAS OF THE EASTERN UNITED STATES,
W69-04477 06G

LOCKETT, JOHN B.

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
W69-04478 02L

LOFFLER, H.
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

LOF, G. O.
'WATER DEMAND FOR STEAM ELECTRIC GENERATION',
W69-04461 06D

LOTSE, ERIK G.
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

LOWRY, WILLIAM P.
MARKOV CHAINS OF ORDER GREATER THAN ONE,
W69-04238 02B

LYNN, WALTER R.
PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
W69-04582 02E

MASS, ARTHUR
BENEFIT-COST ANALYSIS ITS RELEVANCE TO PUBLIC INVESTMENT DECISIONS,
W69-04479 06B

MACE, ARNETT C., JR.
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

MAEHLER, CLAUDE Z.
IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

MALMBERG, GLENN T.
HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
W69-04267 03D

MANNING, J. H.
A SUMMARY REPORT ON MARYLAND'S COMMERCIAL FISHERIES, 1957-1966,
W69-04284 06B

MARKS, DAVID H.
A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

MARSHALL, A. R.
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

MARSHALL, NELSON
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

MATON, GILBERT L.
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

MCCARTY, JAMES C.
THE FUTURE OF AN ESTUARY,
W69-04290 05G

MCCRONE, A. W.
THE HUDSON RIVER ESTUARY HYDROLOGY, SEDIMENTS AND POLLUTION,
W69-04480 05A

MCCULLOUGH, C. A.
DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

MCFARLAND, S. W.
THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

MCGREGOR, JOHN R.
WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

MCGUINNESS, C. L.
SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
W69-04231 04B

MCHUGH, J. L.
ESTUARINE NEKTON,
W69-04292 02L

MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

MCKEAN, R. N.
EFFICIENCY IN GOVERNMENT THROUGH SYSTEMS ANALYSIS,
W69-04482 06B

MCKEE, PAUL W.
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

MCMORROW, MARTIN J. K.
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

MCNATT, E. M.
SEISMIC EXPLORATION AT SEA,
W69-04294 07B

MCQUIVEY, R. S.
SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

MEIER, MARK F.
GLACIERS AND WATER SUPPLY,
W69-04255 02C

METCALF, T. G.
VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

MIHURSKY, JOSEPH A.
PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
W69-04244 02L

MIHURSKY, J. A.
ON POSSIBLE CONSTRUCTIVE USES OF THERMAL ADDITIONS TO ESTUARIES,
W69-04297 05C

MILLER, KENNETH J.
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

MILLIMAN, J. W.
THE ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY,
W69-04483 03A

MILLS, EDWIN S.
A NOTE ON THE ASYMMETRY BETWEEN FEES AND PAYMENTS,
W69-04446 05G

MITCHELL, C. L.
FISH PROTEIN CONCENTRATE SEEN POSSIBLE NEW INDUSTRY,
W69-04299 06B

MOCK, CORNELIUS R.
NATURAL AND ALTERED ESTUARINE HABITATS OF PENAEID SHRIMP,
W69-04484 02L

MOCK, C.
IMPORTANCE OF GULF ESTUARIES AND PROBLEMS FACING OUR FISHERY RESOURCES,
W69-04300 06B

MOORE, A. M.
WATER TEMPERATURES IN THE LOWER COLUMBIA RIVER,
W69-04605 02E

MORGAN, ELMO R.
ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

MORGAN, ROBERT
WHEN DOES A FISHERY BECOME UNECONOMIC,
W69-04485 06B

MORRISON, H. F.
ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

MORSE, CHANDLER
'NATURAL RESOURCES AND THE QUALITY OF LIFE',
W69-04440 06B

MOSS, F.
RELATIONS BETWEEN SPORT AND COMMERCIAL FISHERMEN,
W69-04302 06B

MOURANT, W. A.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

MOWER, R. W.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

MULFORD, S.
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

MURPHY, EARL FINBAR
THE ROLE OF LAW IN A SYSTEM FOR LAKES ERIE AND ONTARIO,
W69-04212 06E

MYSAK, L. A.
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

NAPIER, JEFF W.
STATEMENT,
W69-04303 06B

NARASIMHAN, T. N.
PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
W69-04573 02F

NAUMAN, JOHN W.
TEMPERATURE AND WATER-QUALITY CONDITIONS FOR THE PERIOD JULY, 1963, TO DECEMBER, 1965, PATUXENT RIVER ESTUARY, MARYLAND,
W69-04462 05B

NAYLOR, E.
EFFECTS OF HEATED EFFLUENTS UPON MARINE AND ESTUARINE ORGANISMS,
W69-04486 05C

NELSON, THURLOW C.
SOME ASPECTS OF POLLUTION, PARASITISM, AND INLET RESTRICTION IN THREE NEW JERSEY ESTUARIES,
W69-04304 05C

NEWCOME, ROY, JR.
DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
W69-04268 02F

NEWLAND, LEO W.
LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

NIELSEN, D. R.
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

NITSOS, R. J.
THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

NORRIS, ROBERT M.
SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
W69-04241 02L

NOVAK, CHARLES E.
MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
W69-04547 07B

NRIAGU, JEROME O.
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

NUSBAUM, I.
EFFECTS OF WASTE DISCHARGE FROM POINT LOMA SALINE WATER CONVERSION PLANT ON INTERTIDAL MARINE LIFE,
W69-04280 05C

ODUM, EUGENE P.
STATEMENT,
W69-04306 05D

THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
W69-04307 06F

MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
W69-04334 02L

OLSON, THEOLDORE A.
POLLUTION AND MARINE ECOLOGY.
W69-04310 05G

OREM, HOLLIS M.
DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

ORLOB, G. T.
MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

OVERMAN, ALLEN R.
CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
W69-04261 02F

O'CONNOR, J. D.
ESTUARINE DISTRIBUTION OF NONCONSERVATIVE SUBSTANCES,
W69-04489 05G

PAKHOMOV, S. I.
EFFECT OF HIGH TEMPERATURES ON THE CHEMICAL COMPOSITION OF GROUND WATERS,
W69-04271 02K

PANLIK, G. J.
DIGITAL SIMULATION OF NATURAL ANIMAL COMMUNITIES,
W69-04312 06G

PARKHURST, JOHN D.
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

PATRICK, RUTH
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION,
W69-04314 06G

PATRIC, J. H.
A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

PATTERSON, JAMES L.
STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

PAVLOV, A. N.
A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

PENCE, GEORGE D., JR.
THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

PENNINGTON, WINIFRED
EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
W69-04521 05C

PEREL'MAN, ALEKSANDR I.
GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

PHILLIPS, KENNETH W.
HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

PICKETT, E. E.
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

PINCUS, L.
MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06B

PIONKE, H. B.
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

PLICHON, J. M.
A RIVER HARNESSED THE DURANCE, A SOURCE OF POWER AND AGRICULTURAL PLENITUDE,
W69-04594 04A

PREDDY, W. S.
PREDICTING THE CONDITION OF A POLLUTED ESTUARY,
W69-04469 05B

PRENTICE, J. E.
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

PREST, A. R.
COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

PRICE, J. T.
TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
W69-04203 02E

PRICKETT, T. A.
DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

PRITCHARD, DONALD W.
DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
W69-04559 02L

PRITCHARD, D. W.
A PRELIMINARY ESTIMATE OF THE EFFECT OF DIVERSION OF FLOW FROM THE SUSQUEHANNA RIVER ON THE SALINITY OF THE UPPER CHESAPEAKE BAY,
W69-04493 02L

ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

RADEMACHER, J. M.
SPILL POLLUTION - ITS EFFECTS AND CONTROL,
W69-04322 05G

RAMBOW, CARL A.
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

RANALLI, G.
TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

RANTZ, S. E.
SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

RASMUSSON, EUGENE M.
ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
W69-04246 02A

RAUZI, FRANK
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

REDFORD, POLLY
VANISHING TIDELANDS,
W69-04323 06E

REED, P. H.
THE ANIMAL FOOD FISHERY IN CALIFORNIA, 1961-1962,
W69-04487 06B

REESMAN, A. L.
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

REINHART, KENNETH G.
EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
W69-04632 04C

WATERSHED CALIBRATION METHODS,
W69-04634 03B

REINHART, K. G.
EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

REMIREZ, RAUL
THERMAL POLLUTION HOT ISSUE FOR INDUSTRY,
W69-04325 05C

RETTIG, SHIRLEY L.
SILICA IN ALKALINE BRINES,
W69-04270 02K

RICHARDSON, EVERETT V.
SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

RICHARDSON, MARIE S.
BIBLIOGRAPHY ON AIR AND WATER POLLUTION,
W69-04496 05G

RIECK, C. E.
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

RODIER, J. A.
ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

RODRIQUEZ-ITURBE, IGNACIO
A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
W69-04568 02E

ROGERS, LESLIE C.
WORLD OFFSHORE RIG FLEET TO BALLOON AGAIN IN 1968,
W69-04328 06B

ROPER, HARRY MCK., JR.
THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

RORHOLM, NIELS
ECONOMIC IMPACT OF MARINE-ORIENTED ACTIVITIES--A STUDY OF THE SOUTHERN NEW ENGLAND MARINE REGION,
W69-04330 06B

ROSENBERGER, RICHARD L.
ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

ROSE, D. A.
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
W69-04242 02G

ROTHFUSS, EDWIN L.
BENEATH THE SURFACE,
W69-04497 06B

RUSSELMANN, HEINZ B.
CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
W69-04227 05B

SAMMEL, EDWARD A.
CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
W69-04601 02F

SANTELMANN, P. W.
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

SAVEY, PIERRE
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

SCHEIDEGGER, A. E.
TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

SCHELAKE, CLAIRE L.
MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
W69-04334 02L

SCHMIDT, RALPH A.
NEEDED--A COASTWISE COMPREHENSIVE PROGRAM FOR DEVELOPMENT OF ESTUARIES,
W69-04499 06B

SCHUMAKER, G. A.
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

SCHUMANN, H. H.
WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

SCHUMM, STANLEY A.
RIVER METAMORPHOSIS,
W69-04583 02E

SCOTT, JOHN
WHAT'S AHEAD IN OIL RECOVERY,
W69-04335 05G

SEARS, HOWARD J.
STATEMENT,
W69-04338 06B

SECKLER, DAVID N.
ON THE USES AND ABUSES OF ECONOMIC SCIENCE IN EVALUATING PUBLIC OUTDOOR RECREATION,
W69-04500 06B

SHANE, RICHARD M.
PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
W69-04582 02E

SHARMA, M. L.
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS 2. WATER MOVEMENT,
W69-04589 02G

SHAW, WILLIAM N.
ADVANCES IN THE OFF-BOTTOM CULTURE OF OYSTERS,
W69-04339 06B

SHEMYAKIN, V. N.
A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

SHINDALA, ADNAN
TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
W69-04229 05E

SHUBINSKI, R. P.
MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

SIMMONS, HENRY B.
USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
W69-04580 02L

SKOGERBOE, GAYLORD V.
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

SKOUGSTAD, MARVIN W.
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

SLEASE, CLYDE H.
TESTIMONY - NATIONAL SAND AND GRAVEL ASSOCIATION,
W69-04340 04A

SLOAN, C. E.
GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

SMITH, AUSTIN B.
CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

SMITH, H. F.
EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

SMITH, RAYMOND C.
ECONOMIC AND ENGINEERING ASPECTS OF WATER IN DELAWARE'S AGRI BUSINESS INDUSTRY,
W69-04204 03F

SMOOT, GEORGE F.
MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
W69-04547 07B

SOBEL, MATTHEW J.
WATER QUALITY IMPROVEMENT PROGRAMMING PROBLEMS,
W69-04502 05G

SORENSON, EARL F.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

SPARKS, A. K.
AN ECOLOGICAL SURVEY OF THE HOUSTON SHIP CHANNEL AND ADJACENT BAYS,
W69-04454 05C

SPEIKER, ANDREW H.
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,

W69-04206 02F

STERNBERG, Y. M.
TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

STEVENS, JOE B.
RECREATION BENEFITS FROM WATER POLLUTION CONTROL,
W69-04504 05G

STILES, W. C.
VIRAL POLLUTION OF SHELLFISH IN ESTUARY WATERS,
W69-04296 05C

STINGELIN, RONALD W.
INFRARED IMAGING FOR WATER RESOURCES STUDIES,
W69-04556 07B

STOLLMAN, ISRAEL
A CITY AND REGIONAL PLANNING APPROACH TO A SYSTEMS APPROACH TO WATER QUALITY IN LAKE ERIE AND LAKE ONTARIO,
W69-04214 06E

STRANDBERG, CARL H.
REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
W69-04343 05G

STROBEL, GERALD A.
COLIFORM-FECAL COLIFORM BACTERIA IN TIDAL WATERS,
W69-04344 05G

STROUD, R. H.
THERMAL POLLUTION OF WATER,
W69-04345 05C

STURGES, DAVID L.
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

SUTCLIFFE, P. J. C.
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

SYKES, JAMES E.
THE ROLE OF RESEARCH IN THE PRESERVATION OF ESTUARIES,
W69-04347 04A

TALBOT, J. S.
SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,
W69-04228 05E

TAYLOR, JAMES I.
INFRARED IMAGING FOR WATER RESOURCES STUDIES,
W69-04556 07B

TCHOBANOGLOUS, GEORGE
USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

TENZER, M. J.
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

THIRUMURTHI, D.
OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
W69-04230 05D

THOMANN, ROBERT V.
THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

THOMANN, R. V.
RECENT RESULTS FROM A MATHEMATICAL MODEL OF WATER POLLUTION CONTROL IN THE DELAWARE ESTUARY,
W69-04509 05G

THOMAS, J. C.
MARINE SPORTFISHING SURVEY OF SOUTHERN CALIFORNIA PIERS AND JETTIES, 1963,
W69-04316 06D

THOMAS, ROGER L.
COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
W69-04563 04B

THOMPSON, T. H.
SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

THOMSEN, B. W.
WATER RESOURCES OF THE SYCAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

TITAYEVA, N. A.
ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

TITUS, F. B.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

TOBIAS, LEO
PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
W69-04350 05G

TODOROVIC, PETAR
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

TOFFALETI, FRED B.
DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
W69-04558 02J

TORPEY, WILBUR N.
RESPONSE TO POLLUTION OF NEW YORK HARBOR AND THAMES ESTUARY,
W69-04351 05B

TRAIN, RUSSELL E.
A CALL FOR ACTION,
W69-04352 06B

TRIMBLE, G. R., JR.
EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

TROENDLE, CHARLES A.
EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

TULLER, STANTON E.
WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
W69-04239 02B

TURCAN, A. N., JR.
SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

TURNER, C. E.
THE MARINE ENVIRONMENT IN THE VICINITY OF THE ORANGE COUNTY SANITATION DISTRICTS OCEAN OUTFALL,
W69-04511 05C

TURNER, JERRY L.
FISHERIES PROTECTING AND ENHANCEMENT WITH WATER DEVELOPMENT OF THE SACRAMENTO-SAN JOAQUIN ESTUARY,
W69-04472 06B

TURNER, WM. R.
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

TURVEY, R.
COST-BENEFIT ANALYSIS A SURVEY,
W69-04492 06B

UEHARA, G.
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS 2. WATER MOVEMENT,
W69-04589 02G

FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
W69-04608 02G

UNDERHILL, A. M.
MAINTAINING AND ENHANCING THE ESTUARINE ENVIRONMENT,
W69-04512 06F

VALYASHKO, M. G.
GEOCHEMISTRY OF NATURAL WATERS,
W69-04562 02K

VAN DENBURGH, A. S.
HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

VAYDER, J. D.
DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

VERROSS, WILLIAM J.
STATEMENT,
W69-04354 05G

VERRUIJT, ARNOLD
A NOTE ON THE GHYBEN-HERZBERG FORMULA,
W69-04569 02F

VINCENZ, S. A.
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

WAARA, T.
ORGANIZATION ARRANGEMENT FOR DEVELOPMENT AND OPERATION OF THE MISSOURI RIVER BASIN PROJECTS,
W69-04645 06E

WAHL, KENNETH D.
GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
W69-04625 02F

WALFORD, LIONEL
PROBLEMS OF CONSERVATION IN THE ATLANTIC ESTUARINE ZONE,
W69-04355 06B

STATEMENT ON LIVING MARINE RESOURCES OF WETLANDS AND ESTUARIES,
W69-04356 06B

WALKER, WILLIAM H.
ILLINOIS GROUND WATER POLLUTION,
W69-04256 05B

WALSH, RAYMOND
ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

WARD, S. H.
ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

WARREN, CLINE J.
AGRICULTURAL DEVELOPMENT AND EXPANSION IN THE NILE BASIN PROGRAMS, PRODUCTION AND IMPLICATIONS FOR U. S. AGRICULTURE,
W69-04641 03F

WARRICK, A. W.
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

WASTLER, T. ALLEN
ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
W69-04248 05C

WASTLER, T. A.
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

WEIL, H. H.
PAST, PRESENT AND FUTURE OF SPORT FISHING IN TEXAS WATERS,
W69-04362 06B

WEIS, W. E.
THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

WEST, W. F.
EFFECT OF WATER TEMPERATURE ON STREAM REAERATION,
W69-04468 05G

WHEELER, D. L.
LAND RECLAMATION IN THE PO RIVER DELTA OF ITALY,
W69-04518 04A

WHIPKEY, RONALD Z.
SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

WHITT, MALCOLM L.
OCEAN OUTFALL DESIGN FOR ECONOMY OF CONSTRUCTION,
W69-04313 05E

WICKER, CLARENCE F.
NEW HORIZONS IN THE FIELD OF TIDAL HYDRAULICS,
W69-04579 02L

WILDAVSKY, AARON
THE POLITICAL ECONOMY OF EFFICIENCY COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING,
W69-04519 06B

WILLIAMS, R. E.
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

WINSLOW, A. G.
SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

WURTZ, C. B.
COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

YOUNG, REGINALD H. F.
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

ZELENHASIC, EMIR
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

ORGANIZATIONAL INDEX

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD.
MOISTURE-TENSION DATA FOR SELECTED SOILS ON EXPERIMENTAL WATERSHEDS,
W69-04266 02G

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. SOIL AND WATER CONSERVATION RESEARCH DIV.
GEOMORPHIC GROUPING OF SOILS IN WATERSHED ENGINEERING,
W69-04207 02E

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. SOIL AND WATER CONSERVATION RESEARCH DIV. WYOMING AGRICULTURAL EXPERIMENT STATION, LARAMIE.
WATER INTAKE ON MIDCONTINENTAL RANGELANDS AS INFLUENCED BY SOIL AND PLANT COVER,
W69-04640 02G

AGRICULTURAL RESEARCH SERVICE, FRESNO, CALIF. SOIL AND WATER CONSERVATION RESEARCH DIV.
THE HYDROLOGIC AND GEOLOGIC ASPECTS OF A PERCHING LAYER-SAN JOAQUIN VALLEY, WESTERN FRESNO COUNTY, CALIFORNIA,
W69-04619 02F

AKADEMIYA NAUK SSSR, LENINGRAD.
LIMNOLOGICAL HYPOTHESIS OF THE ORIGIN OF HOT BRINES IN THE RED SEA,
W69-04254 02K

AKADEMIYA NAUK SSSR. INSTITUT GEOLOGII RUDNYKH MESTOROZHDENII, PETROGRAFII, MINERALOGII I GEOKHIMII.
GEOCHEMISTRY OF EPIGENESIS,
W69-04274 02K

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, WASHINGTON, D. C.
ESTUARIES,
W69-04278 02L

ESTUARINE NEKTON,
W69-04292 02L

AMERICAN FISHERIES SOCIETY, ATLANTIC CITY, NEW JERSEY.
MANAGEMENT OF ESTUARINE FISHERIES,
W69-04481 06B

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.
EFFECT OF URBAN DEVELOPMENT ON FLOOD DISCHARGES-CURRENT KNOWLEDGE AND FUTURE NEEDS,
W69-04560 04C

AMERICAN WATER WORKS ASSOCIATION, NEW YORK.
ALLOCATION AND REALLOCATION OF WATER RESOURCES,
W69-04647 05G

BATTELLE MEMORIAL INSTITUTE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WASHINGTON.
OIL SPILLAGE STUDY LITERATURE SEARCH AND CRITICAL EVALUATION FOR SELECTION OF PROMISING TECHNIQUES TO CONTROL AND PREVENT DAMAGE.
W69-04309 05G

BATTELLE MEMORIAL INST., COLUMBUS, OHIO.
A STUDY OF THE U. S. COAST AND GEODETIC SURVEY'S PRODUCTS AND SERVICES AS RELATED TO ECONOMIC ACTIVITY IN THE U. S. CONTINENTAL SHELF REGIONS.
W69-04505 06B

BLACK AND VEATCH, KANSAS CITY, MO.
WATER REUSE FOR PUBLIC SUPPLY,
W69-04265 05D

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF MATHEMATICS
BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY
AND COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CRONULLA (AUSTRALIA). DIV. OF FISHERIES AND OCEANOGRAPHY.
LOW-FREQUENCY SEA LEVEL BEHAVIOR AND CONTINENTAL SHELF WAVES OFF NORTH CAROLINA,
W69-04224 02A

BUREAU OF SPORT FISHERIES AND WILDLIFE, HIGHLANDS, N. J. SANDY HOOK MARINE LAB.
THERMAL POLLUTION AND AQUATIC LIFE,
W69-04235 05A

BUREAU OF SPORT FISHERIES AND WILDLIFE, VERO BEACH, FLA.
PRACTICES AFFECTING SOUTH ATLANTIC AND GULF COAST MARSHES AND ESTUARIES - DREDGING AND FILLING,
W69-04288 04A

CALIFORNIA UNIV., BERKELEY. DEPT. OF MINERAL TECHNOLOGY.
ON INDUCED ELECTRICAL POLARIZATION AND GROUNDWATER,
W69-04606 02F

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
SOIL-WATER DIFFUSIVITY VALUES BASED UPON TIME DEPENDENT SOIL WATER CONTENT DISTRIBUTIONS,
W69-04603 02G

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF GEOGRAPHY.
WORLD DISTRIBUTION OF MEAN MONTHLY AND ANNUAL PRECIPITABLE WATER,
W69-04239 02B

CALIFORNIA UNIV., SANTA BARBARA.
SEA CLIFF RETREAT NEAR SANTA BARBARA, CALIFORNIA,
W69-04241 02L

CARNIGIE-MELLON UNIV., PITTSBURGH, PA. DEPT. OF CIVIL ENGINEERING.
PEAK FLOOD DISCHARGE CONFIDENCE LIMITS,
W69-04582 02E

CHILE UNIV., SANTIAGO.
THE TEACHING AND RESEARCH PROGRAMS IN HYDROLOGY AT FACULTY OF PHYSICAL AND MATHEMATICAL SCIENCES OF THE UNIVERSITY OF CHILE,
W69-04611 09A

COLORADO STATE UNIV., FORT COLLINS AND FOREST SERVICE, WASHINGTON, D. C.
EFFECTS OF SOIL FREEZING ON WATER YIELDS,
W69-04251 02C

A SHIELDED THERMISTOR PROBE WITH PORTABLE INSTRUMENT FOR MEASURING SNOWPACK TEMPERATURES,
W69-04252 07B

OBSERVATIONS OF SNOWPACK ACCUMULATION, MELT, AND RUNOFF ON A SMALL ARIZONA WATERSHED,
W69-04253 02C

COLORADO STATE UNIV., FORT COLLINS.
THE EXTREME VALUES OF PRECIPITATION PHENOMENA,
W69-04567 02B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF GEOLOGY.
RIVER METAMORPHOSIS,
W69-04583 02E

COLORADO UNIV., BOULDER. DEPT. OF CIVIL ENGINEERING AND STANFORD UNIV., CALIF., DEPT. OF CIVIL ENGINEERING.
VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
W69-04264 02K

COMMITTEE ON PUBLIC WORKS (U. S. SENATE).
STATEMENT BEFORE THE SUBCOMMITTEE ON AIR AND WATER POLLUTION, APRIL 17, 1968,
W69-04293 05B

COMPAGNIE NATIONALE DU RHONE (FRANCE).
ONE EXAMPLE OF MULTIPURPOSE DEVELOPMENT PROGRAM THE RHONE,
W69-04592 04A

CORPS OF ENGINEERS, ATLANTA, GA. SOUTH ATLANTIC DIV.
WATER RESOURCES DEVELOPMENT BY THE U S ARMY CORPS OF ENGINEERS IN FLORIDA.
W69-04643 04A

CORPS OF ENGINEERS, BALTIMORE, MD.
FLOOD PLAIN INFORMATION, PISCATAWAY CREEK, PRINCE GEORGES COUNTY, MARYLAND.
W69-04546 04A

CORPS OF ENGINEERS, DETROIT, MICH.
FLOOD PLAIN INFORMATION, RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN.
W69-04529 04A

CORPS OF ENGINEERS, FORT WORTH, TEX.
FLOOD PLAIN INFORMATION, JOHNSON CREEK, ARLINGTON AND GRAND PRAIRIE, TEXAS.
W69-04221 04A

CORPS OF ENGINEERS, JACKSONVILLE, FLA. INTEROCEANIC CANAL STUDIES BRANCH.
CURRENTS IN AN INTEROCEANIC CANAL,
W69-04557 02E

CORPS OF ENGINEERS, LITTLE ROCK, ARK.
FLOOD PLAIN INFORMATION, BLACK RIVER, TOWN AND MANSKER CREEKS, POCAHONTAS, ARKANSAS.
W69-04539 04A

FLOOD PLAIN INFORMATION, ARKANSAS RIVER, NORTH LITTLE ROCK, ARKANSAS.
W69-04541 04A

CORPS OF ENGINEERS, LOS ANGELES, CALIF.
FLOOD PLAIN INFORMATION, LAS CHOLLAS CREEK, SAN DIEGO COUNTY, CALIFORNIA.
W69-04217 04A

FLOOD PLAIN INFORMATION, SANTA CLARA RIVER (SATICOY TO PACIFIC OCEAN), VENTURA COUNTY, CALIFORNIA.
W69-04220 04A

CORPS OF ENGINEERS, LOUISVILLE, KY.
FLOOD PLAIN INFORMATION, OHIO RIVER AND TRIBUTARIES, MC CRACKEN COUNTY, KENTUCKY.
W69-04540 04A

CORPS OF ENGINEERS, MOBILE, ALA.
FLOOD PLAIN INFORMATION, HALLS MILL CREEK, MOBILE, ALABAMA.
W69-04536 04A

FLOOD PLAIN INFORMATION ON CAMP CREEK AND NORTH FORK CAMP CREEK, METROPOLITAN ATLANTA, GEORGIA.
W69-04542 04A

CORPS OF ENGINEERS, NASHVILLE, TENN.
FLOOD PLAIN INFORMATION, CUMBERLAND RIVER AND CLEAR FORK, WILLIAMSBURG, KENTUCKY.

W69-04535 04A

CORPS OF ENGINEERS, PHILADELPHIA, PA. OPERATIONS DIV.
OPTIMUM DREDGING AND DISPOSAL PRACTICES IN ESTUARIES,
W69-04581 02L

CORPS OF ENGINEERS, SACRAMENTO, CALIF.
FLOOD PLAIN INFORMATION, KERN RIVER, KERNVILLE, CALIFORNIA.
W69-04216 04A

FLOOD PLAIN INFORMATION, FEATHER AND YUBA RIVERS, MARYSVILLE YUBA CITY, CALIFORNIA.
W69-04218 04A

FLOOD PLAIN INFORMATION, TULE RIVER, SPRINGVILLE, CALIFORNIA.
W69-04533 04A

CORPS OF ENGINEERS, SAVANNAH, GA.
FLOOD PLAIN INFORMATION, SNAPPINGER CREEK, DEKALB COUNTY, GEORGIA.
W69-04530 04A

FLOOD PLAIN INFORMATION, BROOKLYN CREEK, ATHENS, GEORGIA.
W69-04544 04A

FLOOD PLAIN INFORMATION ON SHOAL CREEK, DEKALB COUNTY, GEORGIA.
W69-04545 04A

CORPS OF ENGINEERS, ST. LOUIS, MO.
FLOOD PLAIN INFORMATION, MERAMEC RIVER, BRUSH CREEK AND FOX CREEK, PACIFIC, MISSOURI.
W69-04537 04A

CORPS OF ENGINEERS, TULSA, OKLA.
FLOOD PLAIN INFORMATION, WALNUT RIVER, WHITEWATER RIVER, KANSAS.
W69-04534 04A

FLOOD PLAIN INFORMATION, MILL CREEK, FORT SMITH, ARKANSAS.
W69-04543 04A

FLOOD PLAIN INFORMATION, POST OAK CREEK AND TRIBUTARIES, SHERMAN, TEXAS.
W69-04576 04A

CORPS OF ENGINEERS, VICKSBURG, MISS.
DEFINITIVE COMPUTATIONS OF SAND DISCHARGE IN RIVERS,
W69-04554 02J

CORPS OF ENGINEERS, WALLA WALLA, WASH.
FLOOD PLAIN INFORMATION, PAYETTE RIVER, PAYETTE, IDAHO AND VICINITY.
W69-04219 04A

FLOOD PLAIN INFORMATION, CLEARWATER RIVER, OROFINO AND RIVERSIDE, IDAHO.
W69-04531 04A

CORPS OF ENGINEERS, WALTHAM, MASS.
FLOOD PLAIN INFORMATION, MILL RIVER, HAMDEN, CONNECTICUT.
W69-04532 04A

DARTMOUTH COLL., HANOVER, N. H. DEPT. OF BIOLOGICAL SCIENCES DARTMOUTH COLL., HANOVER, N. H., DEPT. OF EARTH SCIENCES AND YALE UNIV., NEW HAVEN, CONN. SCHOOL OF FORESTRY.
NITRIFICATION IMPORTANCE TO NUTRIENT LOSSES FROM A CUTOVER FORESTED ECOSYSTEM,
W69-04584 02K

DEGREMONT CO. (FRANCE).
CONDITIONS FOR BETTER FILTERED WATER,
W69-04591 05D

DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
CHANNEL SEDIMENTATION AND DREDGING PROBLEMS, MISSISSIPPI RIVER AND LOUISIANA GULF COAST ACCESS CHANNELS,
W69-04501 04D

DOW CHEMICAL CO., MIDLAND, MICH.
SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,
W69-04228 05E

DUKE UNIV., DURHAM, N. C., DEPT. OF ZOOLOGY.
IDENTIFICATION AND SOLUBILITY OF IRON SULFIDE IN ANAEROBIC LAKE SEDIMENT,
W69-04590 02K

ECONOMIC RESEARCH SERVICE, WASHINGTON, D. C. FOREIGN REGIONAL ANALYSIS DIV.
AGRICULTURAL DEVELOPMENT AND EXPANSION IN THE NILE BASIN PROGRAMS, PRODUCTION AND IMPLICATIONS FOR U. S. AGRICULTURE,
W69-04641 03F

ECONOMIC RESEARCH SERVICE, WASHINGTON, D. C. NATURAL RESOURCE ECONOMICS DIV.
MAJOR USES OF LAND AND WATER IN THE U. S. WITH SPECIAL REFERENCE TO AGRICULTURE, 1964,
W69-04208 03F

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CHICAGO, ILL. AND NEW YORK STATE DEPT. OF HEALTH, ALBANY.
WATER POLLUTION PROBLEMS AND IMPROVEMENT NEEDS, LAKE ONTARIO AND ST. LAWRENCE RIVER BASINS.
W69-04223 05B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DEPARTMENT OF INTERIOR, SOUTHEAST REGION, ATLANTA, GA.
THE URGENT NEED FOR LANDSCAPE ZONING OF THE ESTUARINE REGION ACCORDING TO ECO-SYSTEM PRINCIPLES,
W69-04307 06F

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, MIDDLE ATLANTIC REGION, CHARLOTTESVILLE, VA.
WATER QUALITY AND POLLUTION CONTROL STUDY - JAMES RIVER BASIN.
W69-04359 05G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, SOUTHEAST REGION, ATLANTA, GA.
STATEMENT,
W69-04303 06B

W69-04306 05D

REPORT ON WATER QUALITY CRITERIA FOR TEXAS.
W69-04327 05G

MECHANISMS MAINTAINING HIGH PRODUCTIVITY IN GEORGIA ESTUARIES,
W69-04334 02L

STATEMENT,
W69-04338 06B

STATEMENT.
W69-04342 05G

UTILIZATION OF THE ESTUARINE ZONE IN GEORGIA--A STATEMENT BY BIOLOGISTS FROM THE DIVISION OF BIOLOGICAL SCIENCES OF THE UNIVERSITY OF GEORGIA.
W69-04353 05G

STATEMENT,
W69-04354 05G

COMMON MISUNDERSTANDINGS ABOUT HEATED DISCHARGES,
W69-04364 05C

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D. C. DIV. OF POLLUTION SURVEILLANCE.
A REVIEW OF CHEMICAL MEASUREMENTS IN WATER POLLUTION CONTROL,
W69-04222 05A

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D. C.
POLLUTION OF THE INTERSTATE WATERS OF THE COLORADO RIVER AND ITS TRIBUTARIES....
W69-04272 05E

WASTE FROM WATERCRAFT.
W69-04357 05G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D. C. OFFICE OF ESTUARINE STUDIES.
NATIONAL ESTUARINE INVENTORY HANDBOOK OF DESCRIPTORS,
W69-04358 10

FOREST SERVICE (USDA) COLUMBUS, OHIO. NORTHEASTERN FOREST EXPERIMENT STATION.
SUBSURFACE STORMFLOW FROM FORESTED SLOPES,
W69-04637 02G

THEORY AND MECHANICS OF SUBSURFACE STORMFLOW,
W69-04638 02G

A TECHNIQUE FOR OBTAINING UNDISTURBED SOIL SAMPLES BY FREEZING IN-SITU,
W69-04639 02G

FOREST SERVICE (USDA) DURHAM, N. H. NORTHEASTERN FOREST EXPERIMENT STATION.
EFFECTS OF ABANDONED FARMLAND ON STREAMFLOW,
W69-04635 03B

FOREST SERVICE (USDA) PARSONS, WEST VA. NORTHEASTERN FOREST EXPERIMENT STATION.
A SUBSTITUTE FOR 2,4,5-T IN EASTERN HARDWOOD SPROUT AND BRUSH CONTROL,
W69-04633 03B

FOREST SERVICE (USDA) UPPER DARBY, PA. NORTHEASTERN FOREST EXPERIMENT STATION.
EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
W69-04632 04C

WATERSHED CALIBRATION METHODS,
W69-04634 03B

EFFECT ON STREAMFLOW OF FOUR FOREST PRACTICES IN THE MOUNTAINS OF WEST VIRGINIA,
W69-04636 03B

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
HYDROLOGIC PROPERTIES OF PEAT FROM A WYOMING MOUNTAIN BOG,
W69-04234 02G

FORESTRY SCIENCES LABORATORY, MOSCOW, IDAHO.
THE GENERATION OF SPRING PEAK FLOWS BY SHORT-TERM METEOROLOGICAL EVENTS,
W69-04570 02E

FRESHWATER BIOLOGICAL ASSOCIATION, AMBLESIDE (ENGLAND).
EXPERIMENTS ON THE UTILIZATION OF NITROGEN IN FRESH WATER,
W69-04521 05C

GEOLOGICAL SURVEY OF INDIA, HYDERABAD.
PUMPING TESTS ON OPEN WELLS IN PALAR ALLUVIUM, NEAR MADRAS CITY, INDIA, AN APPLICATION OF THE PAPADOPULOS-COOPER METHOD,
W69-04573 02F

GEOLOGICAL SURVEY, AUSTIN, TEX.
RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE SULFUL RIVER AND CYPRESS CREEK BASINS, TEXAS,
W69-04586 02K

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE CANADIAN RIVER BASIN, TEXAS,
W69-04593 02E

COMPILATION OF HYDROLOGIC DATA, WALLER AND WILBARGER CREEKS, COLORADO RIVER BASIN, TEXAS-1966.
W69-04599 02E

GEOLOGICAL SURVEY, DENVER, COLO.
CONVECTIVE FLOW AND ITS EFFECT ON TEMPERATURE LOGGING IN SMALL-DIAMETER WELLS,
W69-04601 02F

GEOLOGICAL SURVEY, DENVER, COLO. AND DENVER BOARD OF WATER COMMISSIONERS, COLO.
CHEMICAL CHARACTERIZATION OF PUBLIC SUPPLY,
W69-04245 02K

GEOLOGICAL SURVEY, FORT COLLINS, COLO.
SOME TURBULENCE MEASUREMENTS IN OPEN-CHANNEL FLOW,
W69-04555 02E

GEOLOGICAL SURVEY, IOWA CITY, IOWA.
WATER RESOURCES DATA FOR IOWA, 1968--PART 1. SURFACE WATER RECORDS, PART 2. WATER QUALITY RECORDS.
W69-04565 02E

GEOLOGICAL SURVEY, JACKSONVILLE, FLA., AND GEOLOGICAL SURVEY, OCALA, FLA.
TEST HOLE IN AQUIFER WITH MANY WATER-BEARING ZONES AT JACKSONVILLE, FLORIDA,
W69-04620 02F

GEOLOGICAL SURVEY, LANSING, MICH.
GROUND WATER IN GOGEBIC COUNTY, MICHIGAN,
W69-04564 02F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1968,
W69-04561 02F

GEOLOGICAL SURVEY, TACOMA, WASH.
GLACIERS AND WATER SUPPLY,
W69-04255 02C

GEOLOGICAL SURVEY, UNIVERSITY, ALA.
GEOLOGY AND GROUND-WATER RESOURCES OF GREENE COUNTY, ALABAMA,
W69-04625 02F

GEOLOGICAL SURVEY, WASHINGTON, D. C.
FUTURE DEVELOPMENT OF THE GROUND-WATER RESOURCE IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO - PROBLEMS AND ALTERNATIVE SOLUTIONS,
W69-04206 02F

SCIENTIFIC OR RULE-OF-THUMB TECHNIQUES OF GROUND-WATER MANAGEMENT - WHICH WILL PREVAIL,
W69-04231 04B

FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS,
W69-04249 04A

STORAGE REQUIREMENTS FOR ARKANSAS STREAMS,
W69-04250 02E

HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS PAHRUMP VALLEY NEVADA-CALIFORNIA,
W69-04267 03D

DEVELOPMENT OF GROUND-WATER SUPPLIES AT MISSISSIPPI TEST FACILITY, HANCOCK COUNTY, MISSISSIPPI,
W69-04268 02F

SURFACE-WATER HYDROLOGY OF CALIFORNIA COASTAL BASINS BETWEEN SAN FRANCISCO BAY AND EEL RIVER,
W69-04273 03B

MEASUREMENT OF DISCHARGE BY THE MOVING-BOAT METHOD,
W69-04547 07B

HYDROLOGY FOR URBAN LAND PLANNING-A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE,
W69-04548 04C

HYDROLOGY OF CRATER, EAST AND DAVIS LAKES, OREGON,
W69-04574 02H

DISCHARGE IN THE LOWER COLUMBIA RIVER BASIN, 1928-65,
W69-04577 02E

WATER RESOURCES OF THE SICAMORE CREEK WATERSHED, MARICOPA COUNTY, ARIZONA,
W69-04587 02E

GENERALIZED HYDROLOGY OF PRAIRIE POTHOLES ON THE COTEAU DU MISSOURI, NORTH DAKOTA,
W69-04597 02H

TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO,
W69-04598 02E

WATER TEMPERATURES IN THE LOWER COLUMBIA RIVER,
W69-04605 02E

SALINE GROUND WATER IN LOUISIANA,
W69-04608 02F

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS,
W69-04609 02F

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF THE MISSOURI RIVER ALLUVIUM BETWEEN ST. CHARLES AND JEFFERSON CITY, MISSOURI,
W69-04610 02F

GROUND WATER OF THE PIEDMONT AND BLUE RIDGE PROVINCES IN THE SOUTHEASTERN STATES,
W69-04615 02F

FLOOD INFORMATION FOR FLOOD-PLAIN PLANNING,
W69-04616 02E

THE AERATION CAPACITY OF STREAMS,
W69-04628 02E

GEOLOGICAL SURVEY, WASHINGTON, D. C. AND JOHNS HOPKINS UNIV., BALTIMORE, MD., DEPT. OF GEOLOGY.
SILICA IN ALKALINE BRINES,
W69-04270 02K

GEORGIA INST. OF TECH., ATLANTA. SCHOOL OF ARCHITECTURE.
METROPOLITAN PLANNING AND RIVER BASIN PLANNING SOME INTERRELATIONSHIPS,
W69-04566 06A

GEORGIA UNIV., ATHENS. DEPT. OF GEOGRAPHY.
WATER REQUIREMENTS OF SELECTED NORTH GEORGIA MANUFACTURING INDUSTRIES,
W69-04205 06D

GORNYI INSTITUT, LENINGRAD (USSR).
A GEOCHEMICAL CLASSIFICATION OF NATURAL WATERS,
W69-04626 02K

HAWAII UNIV, HONOLULU. WATER RESOURCES RESEARCH CENTER AND HAWAII UNIV., HONOLULU. DEPT. OF AGRONOMY AND SOIL SCIENCE.
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIC LATOSOLS 2. WATER MOVEMENT,
W69-04589 02G

HAWAII UNIV., HONOLULU.
ANAEROBIC DIGESTION OF PINEAPPLE MILL WASTES,
W69-04527 05D

SILICA IN STREAMS AND GROUND WATER OF HAWAII,
W69-04528 02G

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER AND HAWAII UNIV., HONOLULU, DEPT. OF AGRONOMY AND SOIL SCIENCE.
INFLUENCE OF SOIL STRUCTURE ON WATER RELATIONS IN LOW HUMIDIC LATOSOLS 1. WATER RETENTION,
W69-04588 02G

HAYES, SEAY, MATTERN AND MATTERN, ROANOKE, VA.
FLOOD PLAIN INFORMATION, ROANOKE RIVER, AND ROANOKE AND SALEM, VIRGINIA.
W69-04538 04A

HULL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
MAN, VEGETATION AND THE SEDIMENT YIELDS OF RIVERS,
W69-04269 02E

IDAHO UNIV., MOSCOW.
THE INFLUENCE OF GROUNDWATER FLOW SYSTEMS ON PAVEMENT STABILITY IN HIGHWAY CUTS,
W69-04621 02F

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.
TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
W69-04585 02F

ILLINOIS STATE WATER SURVEY, PEORIA AND ILLINOIS UNIV., URBANA. WATER RESOURCES CENTER.
A PROBABILISTIC ANALYSIS OF DISSOLVED OXIGEN-BIOCHEMICAL OXIGEN DEMAND RELATIONSHIP IN STREAMS,
W69-04247 05C

ILLINOIS STATE WATER SURVEY, URBANA.
ILLINOIS GROUND WATER POLLUTION,
W69-04256 05B

COARSE FILTER MEDIA FOR ARTIFICIAL RECHARGE,
W69-04563 04B

DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS,
W69-04623 06B

ILLINOIS UNIV., URBANA.
TOPOLOGICAL SIGNIFICANCE OF STREAM METHODS,
W69-04571 02E

ILLINOIS UNIV., URBANA. DEPT. OF AGRONOMY.
CONVECTIVE DIFFUSION IN CLAY SYSTEMS,
W69-04261 02F

INDIANA UNIV., BLOOMINGTON. DEPT. OF GEOLOGY.

TRANSMISSIBILITY DETERMINATION FROM VARIABLE DISCHARGE PUMPING TESTS,
W69-04622 02F

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN, WASHINGTON, D. C.
'WASTE DISPOSAL AND WATER SUPPLY',
W69-04438 05G

NUTRIENTS,
W69-04448 05C

LITTERING AND OBSTRUCTIONS,
W69-04450 06E

RECREATION,
W69-04458 06B

JACKSONVILLE UNIV., FLA. DIV. OF BUSINESS ADMINISTRATION.
THE IMPACT OF THE PORT OF JACKSONVILLE ON THE ECONOMY OF THE COMMUNITY,
W69-04517 06B

JOHNS HOPKINS UNIVERSITY, CHESAPEAKE BAY INSTITUTE.
ON THE PREDICTION OF THE DISTRIBUTION OF EXCESS TEMPERATURE FROM A HEATED DISCHARGE IN AN ESTUARY,
W69-04494 05C

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
DISPERSION AND FLUSHING OF POLLUTANTS IN ESTUARIES,
W69-04559 02L

KING'S COLL., LONDON (ENGLAND) AND SIR JOHN CASS COLL., LONDON (ENGLAND).
SEDIMENT TRANSPORT IN ESTUARINE AREAS,
W69-04240 02L

LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS.
TOURISM AND RECREATION.
W69-04510 06B

MARYLAND UNIV., SOLOMONS. NATURAL RESOURCES INST. AND MARYLAND DEPT. OF NATURAL RESOURCES.
PATUXENT THERMAL STUDIES - SUMMARY AND RECOMMENDATIONS,
W69-04244 02L

MARYLAND WATER RESOURCES COMMISSION, ANNAPOLIS AND DEPARTMENT OF WATER RESOURCES, ANNAPOLIS, MD.
GENERAL WATER QUALITY CRITERIA AND SPECIFIC WATER QUALITY STANDARDS.
W69-04470 05G

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
SALINITY INTRUSION EFFECTS IN ESTUARY SHOALING,
W69-04558 02L

MCGILL UNIV., MONTREAL (QUEBEC).
GEOLOGY OF GLACIAL LAKE AGASSIZ,
W69-04617 02H

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
FLOOD AND POLLUTION CONTROL A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA.
W69-04630 04A

CHICAGO TUNNEL DRAINAGE PROJECT PRELIMINARY EVALUATION OF FEASIBILITY.
W69-04631 04A

MIAMI UNIV., CORAL GABLES, FLA. DEPT. OF CIVIL ENGINEERING.
OZONE IN WATER TREATMENT AND WASTEWATER RENOVATION,
W69-04230 05D

MICHIGAN STATE UNIV., LANSING. DEPT. OF SOIL SCIENCE AND HAWAII UNIV., HONOLULU. DEPT. OF AGRONOMY AND SOIL SCIENCE.
FACTORS IMPORTANT IN THE CALCULATION OF HYDRAULIC CONDUCTIVITY,
W69-04604 02G

MID-CHESHIRE WATER BOARD (ENGLAND).
FRESH WATER,
W69-04225 03B

MISSISSIPPI STATE UNIV., STATE COLLEGE. DEPT. OF SANITARY ENGINEERING.
TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,
W69-04229 05E

MOBIL RESEARCH AND DEVELOPMENT CORP., DALLAS, TEX. FIELD RESEARCH LAB.
THE DRYING THROUGH THE TOP SURFACE OF A VERTICAL POROUS COLUMN,
W69-04602 02G

MONTGOMERY RESEARCH, INC., PASADENA, CALIF.
INDUSTRIAL WASTEWATER RECLAMATION,
W69-04226 05D

MOSCOW STATE UNIV. (USSR). DEPT. OF GEOCHEMISTRY.
GEOCHEMISTRY OF NATURAL WATERS,
W69-04562 02K

MOSCOW STATE UNIV., (USSR). DEPT. OF GEOCHEMISTRY.
ASSOCIATION OF RADIUM AND URANIUM AND PEAT,
W69-04612 02K

NATIONAL ASSOCIATION OF MANUFACTURERS, NEW YORK AND CHAMBER OF COMMERCE OF THE UNITED STATES, WASHINGTON, D. C.
WATER IN INDUSTRY A SURVEY OF WATER USE IN INDUSTRY.
W69-04514 05D

NATIONAL SECURITY INDUSTRIAL ASSOCIATION, WASHINGTON, D. C.
MARINE, ESTUARIAN, AND RIPARIAN POLLUTION DISASTERS AND THEIR CONSEQUENCES.
W69-04285 05G

SPILL POLLUTION - ITS EFFECTS AND CONTROL,
W69-04322 05G

REMOTE SENSOR SURVEILLANCE OF WATER QUALITY,
W69-04343 05G

PROTECTION AND RESTORATION OF BEACHES DURING AND AFTER OIL SPILLS,
W69-04350 05G

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING.
GENERALIZED RAINFALL-DURATION-FREQUENCY RELATIONSHIPS,
W69-04549 02A

NEW YORK STATE DEPT. OF HEALTH, ALBANY.
CHARACTERISTICS OF WATER TREATMENT PLANT WASTES,
W69-04227 05B

NOTTINGHAM UNIV. (ENGLAND). SCHOOL OF AGRICULTURE.
VARIATIONS OF EVAPORATION IN TIME AND SPACE PART 1 AND PART 2,
W69-04618 02D

OFFICE FOR SCIENTIFIC AND TECHNICAL RESEARCH OVERSEAS, PARIS (FRANCE).
ORGANIZATION OF SURVEYS AND HYDROLOGICAL RESEARCH IN DEVELOPING COUNTRIES,
W69-04614 06E

OHIO STATE UNIV., COLUMBUS. WATER RESOURCES CENTER.
THE ROLE OF LAW IN A SYSTEM FOR LAKES ERIE AND ONTARIO,
W69-04212 06E

A CITY AND REGIONAL PLANNING APPROACH TO A SYSTEMS APPROACH TO WATER QUALITY IN LAKE ERIE AND LAKE ONTARIO,
W69-04214 06E

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRONOMY.
INFLUENCE OF WATER FLUX AND POROUS MATERIAL ON THE MOVEMENT OF SELECTED HERBICIDES,
W69-04258 05B

OREGON STATE UNIV., CORVALLIS. DEPT. OF STATISTICS.
MARKOV CHAINS OF ORDER GREATER THAN ONE,
W69-04238 02B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING AND HRB-SINGER, INC., STATE COLLEGE, PA.
INFRARED IMAGING FOR WATER RESOURCES STUDIES,
W69-04556 07B

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
A DISSIPATIVE RIVER FLOW MODEL,
W69-04232 02A

RESEARCH COUNCIL OF ALBERTA, EDMONTON.
A COMPUTER-ORIENTED GROUND-WATER INFORMATION STORAGE AND RETRIEVAL SYSTEM,
W69-04624 07C

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D. C.
MANAGING WATER QUALITY ECONOMICS, TECHNOLOGY, INSTITUTIONS,
W69-04578 05G

ROTHAMSTED EXPERIMENTAL STATION, HARPENDEN (ENGLAND).
WATER MOVEMENT IN POROUS MATERIALS - III. EVAPORATION OF WATER FROM SOIL,
W69-04242 02G

SAINT LOUIS UNIV., ST. LOUIS, MO.
RESISTIVITY INVESTIGATIONS OF LIMESTONE AQUIFERS IN JAMAICA,
W69-04600 02F

SERVICES TECHNIQUES DE LA VILLE DE PARIS (FRANCE).
USE OF MULTI-PURPOSE STORAGE DAMS IN THE DEVELOPMENT OF THE SEINE BASIN,
W69-04596 04A

SOCIETE HISPANO-SUIZA, BOIS-COLOMBES (FRANCE).
THE CONSTRUCTION BY FRANCE OF A MIXED PLANT FOR PRODUCTION OF ELECTRIC POWER AND OF SOFT WATER,
W69-04595 03A

STANFORD UNIV., CALIF.
NUTRIENT AND POLLUTANT RESPONSE OF ESTUARINE BIOTAS,
W69-04276 05C

USE OF HYDRAULIC AND MATHEMATICAL MODELS FOR DETERMINING EFFLUENT DIFFUSION IN SOUTH SAN FRANCISCO BAY,
W69-04277 05B

ESTUARINE POLLUTION OF THE CHAO PHRAYA RIVER AT BANGKOK, THAILAND,
W69-04279 05B

A 'BALAS' ALGORITHM FOR ZONED UNIFORM TREATMENT,
W69-04281 05D

IDENTIFICATION OF PETROLEUM PRODUCTS IN ESTUARINE WATERS,
W69-04282 05A

THE FUTURE OF AN ESTUARY,
W69-04290 05G

DELTA-SUISUN BAY WATER QUALITY INVESTIGATION,
W69-04291 02L

MATHEMATICAL MODELING OF WATER QUALITY IN ESTUARIAL SYSTEMS,
W69-04311 05B

THE DEVELOPMENT AND APPLICATION OF A TIME-VARYING DISSOLVED OXYGEN MODEL,
W69-04315 05G

THE ROLE OF THE PHYSICAL HYDRAULIC MODEL OF SAN FRANCISCO BAY AND DELTA IN POLLUTION STUDIES,
W69-04329 05B

ESTUARINE WATER QUALITY MANAGEMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA,
W69-04331 05G

STATE PLANNING OFFICE, SANTA FE, NEW MEX. AND GEOLOGICAL SURVEY, WASHINGTON, D. C.
WATER RESOURCES OF NEW MEXICO, OCCURRENCE, DEVELOPMENT AND USE,
W69-04627 02E

SWITZER (ALBERT) AND ASSOCIATES, INC., BATON ROUGE, LA.
FLOOD PLAIN INFORMATION, CALCASIEU RIVER, OAKDALE, LOUISIANA.
W69-04215 04A

TAMPA-HILLSBOROUGH BAY TECHNICAL ASSISTANCE PROJECT, TAMPA, FLA. AND FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D. C., OFFICE OF ESTUARINE STUDIES.
ORGANIC CARBON-ORGANIC NITROGEN RATIOS OF SEDIMENTS IN A POLLUTED ESTUARY,
W69-04248 05C

TECHNION - ISRAEL INST. OF TECH., HAIFA. DEPT. OF CIVIL ENGINEERING.
EVALUATION OF SEGMENTED IUH FROM DERIVATIVES,
W69-04553 02A

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
A NOTE ON THE GHYBEN-HERZBERG FORMULA,
W69-04569 02F

TENNESSEE VALLEY AUTHORITY, KNOXVILLE.
TRANSIENT FLOW INVESTIGATIONS FOR TVA'S BROWNS FERRY GENERATING STATION.
W69-04203 02E

BENEFIT-COST ANALISIS FOR WATER RESOURCES PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY.
W69-04629 06B

TENNESSEE VALLEY AUTHORITY, KNOXVILLE. DIV. OF RESERVOIR PROPERTIES.
THE BUFFALO SCENIC RIVERWAY.
W69-04201 06B

TENNESSEE VALLEY AUTHORITY, KNOXVILLE. DIV. OF WATER CONTROL PLANNING AND WISCONSIN UNIV., MADISON. DEPT. OF CIVIL ENGINEERING.
STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
W69-04551 02E

TENNESSEE VALLEY AUTHORITY, KNOXVILLE. FISH AND WILDLIFE BRANCH.
EFFECTS OF FERTILIZER ON FOOD CHAIN ORGANISMS AND FISH PRODUCTION IN NORRIS RESERVOIR, TENNESSEE.
W69-04202 02I

THOMPSON (JOHN I.) AND CO., WASHINGTON, D. C.
A PERSPECTIVE OF REGIONAL AND STATE MARINE ENVIRONMENTAL ACTIVITIES, A QUESTIONNAIRE SURVEY, STATISTICS AND OBSERVATIONS,
W69-04289 06E

UNIVERSIDAD NACIONAL DEL ZULIA, MARACAIBO (VENEZUELA). CIVIL ENGINEERING SCHOOL.
A MODERN STATISTICAL STUDY OF MONTHLY LEVELS OF THE ORINOCO RIVER,
W69-04568 02E

UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF PHYSICS.
VISCOUS DRAG AND SECONDARY FLOW IN GRANULAR BEDS,
W69-04243 02F

UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL ENGINEERING.
FREE-SURFACE FLOW THROUGH HETEROGENEOUS POROUS MEDIA,
W69-04552 02F

UTAH WATER RESEARCH LAB., LOGAN.
HYDROLOGIC ATLAS OF UTAH,
W69-04209 02A

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF GEOLOGY AND MISSOURI UNIV., COLUMBIA. DEPT. OF AGRICULTURAL CHEMISTRY.
ALUMINUM IONS IN AQUEOUS SOLUTIONS,
W69-04575 02K

WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
USE OF MODELS IN RESOLVING TIDAL PROBLEMS,
W69-04580 02L

WEATHER BUREAU, HELENA, MONT. AIRPORT STATION.
CENTRAL MONTANA RAINSTORMS AND FLOODS, JUNE 6-15, 1967,
W69-04237 02B

WEATHER BUREAU, WASHINGTON, D. C. GEOPHYSICAL FLUID DYNAMICS LAB.
ATMOSPHERIC WATER VAPOR TRANSPORT AND THE WATER BALANCE OF NORTH AMERICA- 2. LARGE-SCALE WATER BALANCE INVESTIGATIONS,
W69-04246 02A

WESTERN RESERVE UNIV., CLEVELAND, OHIO. DEPT. OF BIOLOGY.
ON QUESTIONS OF PRODUCTION AND PRODUCTIVITY IN ECOLOGY,
W69-04524 02K

WISCONSIN UNIV., MADISON. DEPT. OF GEOLOGY.
SULFUR METABOLISM AND SEDIMENTARY ENVIRONMENT LAKE MENDOTA, WISCONSIN,
W69-04526 05C

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.
EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHATE INSECTICIDES FROM LAKE WATERS,
W69-04523 05A

LINDANE ADSORPTION BY LAKE SEDIMENTS,
W69-04525 05G

WYOMING UNIV., LARAMIE. MINUTEMAN SCHOOL OF CIVIL ENGINEERING.
REFRACTION DETERMINATION OF WATER TABLE DEPTH AND ALLUVIUM THICKNESS,
W69-04607 02E

YALE UNIV., NEW HAVEN, CONN. DEPT. OF GEOLOGY.
MIGRATION OF IRON AND SULFUR WITHIN ANAEROBIC SEDIMENTS DURING EARLY DIAGENESIS,
W69-04572 02K

YALE UNIV., NEW HAVEN, CONN. OSBORN ZOOLOGICAL LAB AND AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK.
A DIRECT DEMONSTRATION OF THE PHOSPHORUS CYCLE IN A SMALL LAKE,
W69-04520 02H

YALE UNIV., NEW HAVEN, CONN. OSBORN ZOOLOGICAL LAB.
THE THERMAL CLASSIFICATION OF LAKES,
W69-04522 02H

ACCESSION NUMBER INDEX

W69-04201	06B
W69-04202	02I
W69-04203	02E
W69-04204	03F
W69-04205	06D
W69-04206	02F
W69-04207	02E
W69-04208	03F
W69-04209	02A
W69-04212	06E
W69-04214	06E
W69-04215	04A
W69-04216	04A
W69-04217	04A
W69-04218	04A
W69-04219	04A
W69-04220	04A
W69-04221	04A
W69-04222	05A
W69-04223	05B
W69-04224	02A
W69-04225	03B
W69-04226	05D
W69-04227	05B
W69-04228	05E
W69-04229	05E
W69-04230	05D
W69-04231	04B
W69-04232	02A
W69-04234	02G
W69-04235	05A
W69-04237	02B
W69-04238	02B
W69-04239	02B
W69-04240	02L
W69-04241	02L
W69-04242	02G
W69-04243	02F
W69-04244	02L
W69-04245	02K
W69-04246	02A
W69-04247	05C
W69-04248	05C
W69-04249	04A
W69-04250	02E
W69-04251	02C
W69-04252	07B
W69-04253	02C
W69-04254	02K
W69-04255	02C
W69-04256	05B
W69-04258	05B
W69-04261	02F
W69-04264	02K
W69-04265	05D
W69-04266	02G
W69-04267	03D
W69-04268	02F
W69-04269	02E
W69-04270	02K
W69-04271	02K
W69-04272	05E
W69-04273	03B
W69-04274	02K
W69-04275	06C
W69-04276	05C
W69-04277	05B
W69-04278	02L
W69-04279	05B
W69-04280	05C
W69-04281	05D
W69-04282	05A
W69-04283	06B
W69-04284	06B
W69-04285	05G
W69-04286	06E
W69-04287	04A
W69-04288	04A
W69-04289	06E
W69-04290	05G
W69-04291	02L
W69-04292	02L
W69-04293	05B
W69-04294	07B
W69-04295	06B
W69-04296	05C
W69-04297	05C
W69-04299	06B
W69-04300	06B
W69-04301	06E
W69-04302	06B
W69-04303	06B
W69-04304	05C
W69-04305	06B
W69-04306	05D
W69-04307	06F
W69-04308	05B
W69-04309	05G
W69-04310	05G
W69-04311	05B
W69-04312	06G
W69-04313	05E
W69-04314	06G
W69-04315	05G
W69-04316	06B
W69-04317	06B
W69-04318	05B
W69-04319	05G
W69-04320	06C
W69-04321	04A
W69-04322	05G
W69-04323	06E
W69-04324	04A
W69-04325	05C
W69-04326	05G
W69-04327	05G
W69-04328	06B
W69-04329	05B
W69-04330	06B
W69-04331	05G
W69-04332	05G
W69-04333	05G
W69-04334	02L
W69-04335	05G
W69-04336	06B
W69-04337	06B
W69-04338	06B
W69-04339	06B
W69-04340	04A
W69-04341	06E
W69-04342	05G
W69-04343	05G
W69-04344	05G
W69-04345	05C
W69-04346	06B
W69-04347	04A
W69-04348	06B
W69-04349	05C
W69-04350	05G
W69-04351	05B
W69-04352	06B
W69-04353	05G
W69-04354	05G
W69-04355	06B
W69-04356	06B
W69-04357	05G
W69-04358	10
W69-04359	05G
W69-04360	09D
W69-04361	04A
W69-04362	06B
W69-04363	06B
W69-04364	05C
W69-04365	04A
W69-04366	05B
W69-04367	04A
W69-04368	06E
W69-04369	06E
W69-04370	06E
W69-04371	04C
W69-04372	05B
W69-04373	04A
W69-04374	06E
W69-04375	06E
W69-04376	06E
W69-04377	05G
W69-04378	06E
W69-04379	04A
W69-04380	04D
W69-04381	06E
W69-04382	05G
W69-04383	06E
W69-04384	06E
W69-04385	06E
W69-04386	06E
W69-04387	06E
W69-04388	05G
W69-04389	04D
W69-04390	05G
W69-04391	05B
W69-04392	05G
W69-04393	04A
W69-04394	05F
W69-04395	05G
W69-04396	05G
W69-04397	04A
W69-04398	04A
W69-04399	06E
W69-04400	05G
W69-04401	04A
W69-04402	06E
W69-04403	04A
W69-04404	05G
W69-04405	04A
W69-04406	04A
W69-04407	06E
W69-04408	06E
W69-04409	06E
W69-04410	06E
W69-04411	06E
W69-04412	04A
W69-04413	06E
W69-04414	06E
W69-04415	05G
W69-04416	03F
W69-04417	04A
W69-04418	04C
W69-04419	06E
W69-04420	05G
W69-04421	06E
W69-04422	06E
W69-04423	04A
W69-04424	05G
W69-04425	05G

W69-04426	06E
W69-04427	03D
W69-04428	05G
W69-04429	04A
W69-04430	06E
W69-04431	06E
W69-04432	06E
W69-04433	06E
W69-04434	06E
W69-04435	06E
W69-04436	06B
W69-04437	05G
W69-04438	05G
W69-04439	05B
W69-04440	06B
W69-04441	03A
W69-04442	06B
W69-04443	06C
W69-04444	02L
W69-04445	05C
W69-04446	05G
W69-04447	05C
W69-04448	05C
W69-04449	06B
W69-04450	06E
W69-04451	05D
W69-04452	05B
W69-04453	06B
W69-04454	05C
W69-04455	06E
W69-04456	05C
W69-04457	05G
W69-04458	06B
W69-04459	08C
W69-04460	06C
W69-04461	06D
W69-04462	05B
W69-04463	03A
W69-04464	03C
W69-04465	05D
W69-04466	02L
W69-04467	02A
W69-04468	05G
W69-04469	05B
W69-04470	05G
W69-04471	05D
W69-04472	06B
W69-04473	06B
W69-04474	06B
W69-04475	06D
W69-04476	06B
W69-04477	06G
W69-04478	02L
W69-04479	D5B
W69-04480	05A
W69-04481	06B
W69-04482	06B
W69-04483	03A
W69-04484	02L
W69-04485	06B
W69-04486	05C
W69-04487	06B
W69-04489	05G
W69-04490	05G
W69-04491	08A
W69-04492	06B
W69-04493	02L
W69-04494	05C
W69-04495	06B
W69-04496	05G
W69-04497	06B
W69-04498	03A
W69-04499	06B
W69-04500	06B
W69-04501	04D
W69-04502	05G
W69-04503	08B
W69-04504	05G
W69-04505	06B
W69-04506	07B
W69-04507	05D
W69-04509	05G
W69-04510	06B
W69-04511	05C
W69-04512	06F
W69-04513	03A
W69-04514	05D
W69-04515	05G
W69-04516	05G
W69-04517	06B
W69-04518	04A
W69-04519	06B
W69-04520	02H
W69-04521	05C
W69-04522	02H
W69-04523	05A
W69-04524	02K
W69-04525	05G
W69-04526	05C
W69-04527	05D
W69-04528	02G
W69-04529	04A
W69-04530	04A
W69-04531	04A
W69-04532	04A
W69-04533	04A
W69-04534	04A
W69-04535	04A
W69-04536	04A
W69-04537	04A
W69-04538	04A
W69-04539	04A
W69-04540	04A
W69-04541	04A
W69-04542	04A
W69-04543	04A
W69-04544	04A
W69-04545	04A
W69-04546	04A
W69-04547	07B
W69-04548	04C
W69-04549	02A
W69-04551	02E
W69-04552	02F
W69-04553	02A
W69-04554	02J
W69-04555	02B
W69-04556	07B
W69-04557	02E
W69-04558	02L
W69-04559	02L
W69-04560	04C
W69-04561	02F
W69-04562	02K
W69-04563	04B
W69-04564	02F
W69-04565	02E
W69-04566	06A
W69-04567	02B
W69-04568	02E
W69-04569	02F
W69-04570	02E
W69-04571	02E
W69-04572	02K
W69-04573	02F
W69-04574	02H
W69-04575	02K
W69-04576	04A
W69-04577	02E
W69-04578	05G
W69-04579	02L
W69-04580	02L
W69-04581	02L
W69-04582	02E
W69-04583	02E
W69-04584	02K
W69-04585	02F
W69-04586	02K
W69-04587	02E
W69-04588	02G
W69-04589	02G
W69-04590	02K
W69-04591	05D
W69-04592	04A
W69-04593	02E
W69-04594	04A
W69-04595	03A
W69-04596	04A
W69-04597	02H
W69-04598	02E
W69-04599	D2E
W69-04600	02F
W69-04601	02F
W69-04602	02G
W69-04603	02G
W69-04604	02G
W69-04605	02E
W69-04606	02F
W69-04607	02E
W69-04608	02F
W69-04609	02F
W69-04610	02F
W69-04611	09A
W69-04612	02K
W69-04613	04A
W69-04614	06E
W69-04615	02F
W69-04616	02E
W69-04617	02H
W69-04618	02D
W69-04619	02F
W69-04620	02F
W69-04621	02F
W69-04622	02F
W69-04623	06B
W69-04624	07C
W69-04625	02F
W69-04626	02K
W69-04627	D2E
W69-04628	02E
W69-04629	06B
W69-04630	04A
W69-04631	04A
W69-04632	04C
W69-04633	03B
W69-04634	03B
W69-04635	03B
W69-04636	03B
W69-04637	02G
W69-04638	02G
W69-04639	02G
W69-04640	02G
W69-04641	03F
W69-04643	04A
W69-04644	06E
W69-04645	06E
W69-04646	06B
W69-04647	05G
W69-04648	06E
W69-04649	06E
W69-04650	04A
W69-04651	06E

W69-04652	06E
W69-04653	04D
W69-04654	05B
W69-04655	04A
W69-04656	04A
W69-04657	06E
W69-04658	04A
W69-04659	05G
W69-04660	06E
W69-04661	06E
W69-04662	04A
W69-04663	04A
W69-04664	05G
W69-04665	04A
W69-04666	06E
W69-04667	06E
W69-04668	05G
W69-04669	06E
W69-04670	06E
W69-04671	06E
W69-04672	06E
W69-04673	04C
W69-04674	04A
W69-04675	06E
W69-04676	04C
W69-04677	05G
W69-04678	05G
W69-04679	06E
W69-04680	04C
W69-04681	05G
W69-04682	04A
W69-04683	06E
W69-04684	04A
W69-04685	04A
W69-04686	04A
W69-04687	05G
W69-04688	06D
W69-04689	04A
W69-04690	06D
W69-04691	06E
W69-04692	04A
W69-04693	04A
W69-04694	06E
W69-04695	03D
W69-04696	03D
W69-04697	03D
W69-04698	04D
W69-04699	06E
W69-04700	06E

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

0 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

LIBRARY RATE
PRINTED MATTER

U.S. DEPARTMENT OF COMMERCE
CLEARINGHOUSE FOR FEDERAL
SCIENTIFIC AND TECHNICAL INFORMATION
SPRINGFIELD, VA. 22151

OFFICIAL BUSINESS